

# MISSISSIPPI ACADEMY OF SCIENCES



SIXTY-EIGHTH ANNUAL MEETING

February 19 & 20, 2004

Biloxi, MISSISSIPPI

President Casino Broadwater Towers

2060 Beach Boulevard

Hosted by

The University of Mississippi Medical Center

# Journal of the Mississippi Academy of Sciences

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Academy of Sciences

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**SCHEDULE****WEDNESDAY, FEBRUARY 18, 2004**

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<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
3:30 PM to 7:00 PM	Registration	Hotel Lobby
4:00 PM to 6:00 PM	Board of Directors Meeting	Mary Mahoney's Old French House

**THURSDAY, FEBRUARY 19, 2004**

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<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
8:00 AM to 4:30 PM	Registration	Island Bar
8:30 AM to 9:15 AM	Plenary Session I—Audrey K. Tsao	Gulf Hall
9:00 AM to 7:00 PM	Exhibits	Crystal and Topaz Rooms
9:15 AM to 4:30 PM	Divisional Programs	See Pages 18–120
12:00 AM to 12:40 PM	Plenary Session II—Richard Alley and Joan Fitzpatrick	Gulf Hall
1:00 PM to 4:30 PM	Symposium on Climate Change (associated with Plenary Session II)	Gulf Hall
2:00 PM to 4:00 PM	Mississippi Center for Supercomputing Research	Ship Isle
4:30 PM	2004 Dodgen Lecture & Presentation of Awards; lecture by Herman A. Taylor, Jr.	Gulf Hall
6:00 PM to 7:00 PM	Hospitality Hour	Crystal and Topaz Rooms
7:00 PM	MAMP Team Meeting followed by a student meeting	Gulf Hall

**FRIDAY, FEBRUARY 20, 2004**

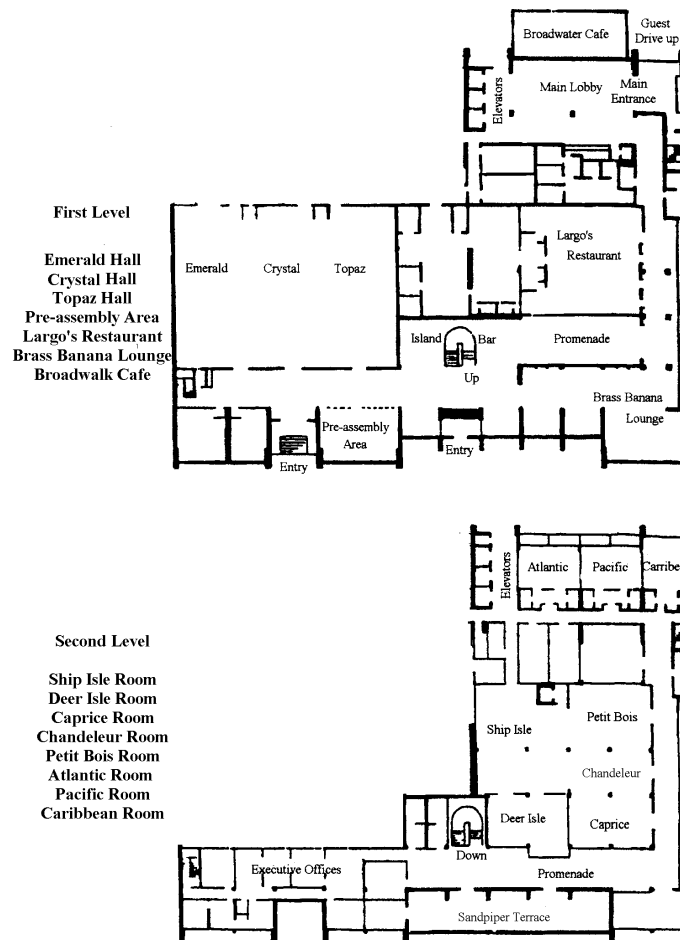
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<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
7:15 AM	Past-Presidents' Breakfast	To Be Announced
8:00 AM to 2:00 PM	Registration	Island Bar
8:15 AM to 8:45 AM	MAS Business Meeting	Ship Isle
8:30 AM to 11:30 AM	Mississippi Functional Genomics Network	Gulf Hall
8:45 AM to 4:30 PM	Divisional Programs	See Pages 18–120
9:00 to Noon	Exhibits	Crystal and Topaz Rooms
9:30 AM to 11:30 AM	Workshop on Biostatistical Analysis	Ship Isle
12:00 AM to 12:40 PM	Plenary Session III—Joseph A. Cameron	Gulf Hall
1:00 PM to 2:15 PM	Workshop on CPR—Martha Howard, Karen Bell, and Chris Powell	Gulf Hall
1:00 PM to 4:30 PM	Symposium: GIS and Remote Sensing in Health Sciences	Emerald Room

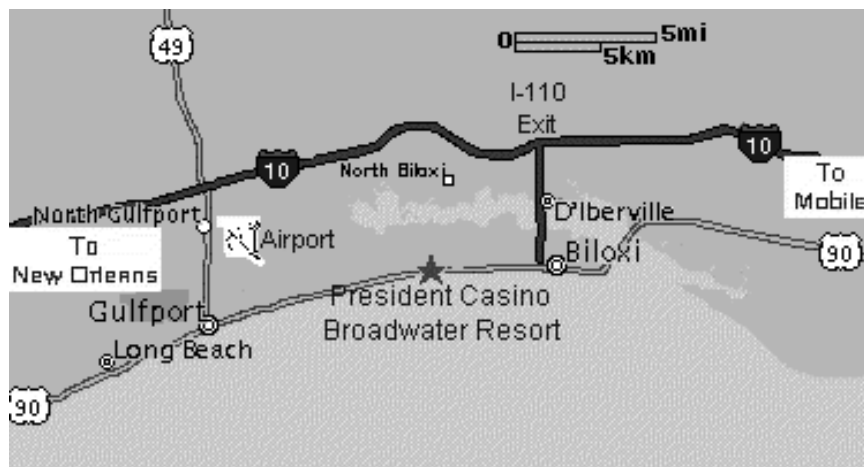
## MISSISSIPPI ACADEMY OF SCIENCES MEETING OVERVIEW

	Emerald	Topaz/Crystal	Deer Isle	Caprice	Chandeur	Petit Bois	Caribbean	Pacific	Atlantic	Ship Isle	Gulf Hall
THURSDAY MORNING	Health Sciences	Exhibits	Marine and Atmospheric Science	Cellular, Molecular and Developmental Biology	Chemistry and Chemical Engineering Session A	Chemistry and Chemical Engineering Session B	Agriculture and Plant Science	Science Education	History and Philosophy of Science	Mathematics, Computer Science and Statistics	Plenary I Orthopaedics and Engineering
THURSDAY NOON											Plenary II Climate Change
THURSDAY AFTERNOON	Health Sciences	Exhibits	Zoology and Entomology Symposium on Sickle Cell Anemia	Cellular, Molecular and Developmental Biology	Chemistry and Chemical Engineering Session A	Chemistry and Chemical Engineering Session B	Agriculture and Plant Science	Science Education	History and Philosophy of Science	Mathematics, Computer Science and Statistics Supercomputing Session	Geol & Geog Mar & Atmos Sci Symposium on Climate Change
THURSDAY EVENING		Hospitality Hour (follows Dodge Lecture)									Dodge Lecture Jackson Heart Study
FRIDAY MORNING	Health Sciences	Exhibits	Marine and Atmospheric Science	Cellular, Molecular and Developmental Biology	Chemistry and Chemical Engineering	Psychology and Social Sciences Special Session on Moran Studio Burials	Physics and Engineering	Geology and Geography	Ecology and Evolutionary Biology	MAS Business Meeting	Cell, Mol & Dev Biology
										Mathematics, Computer Science and Statistics Workshop on Biostatistical Analysis	Mississippi Functional Genomics Network Session
FRIDAY NOON											Plenary III Bridges of the Baccalaureate Degree Program
FRIDAY AFTERNOON	Health Sciences Symposium on GIS and Remote Sensing in Health Sciences		Marine and Atmospheric Science	Cellular, Molecular and Developmental Biology	Psychology and Social Sciences Session B	Psychology and Social Sciences Session A	Physics and Engineering	Geology and Geography	Ecology and Evolutionary Biology		Health Sciences Workshop on CPG

## President Casino Broadwater Towers



Gulf Hall is located in the small building across the parking lot from the Main Entrance of the Broadwater Hotel





## Premier Exhibitors

In addition to their participation in our annual meeting,  
these exhibitors continue to support the Academy and ask for your support!

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## The Jackson Heart Study Confronts the Heart of an Epidemic

Herman A. Taylor, Jr., M.D., F.A.C.C., F.A.H.A., Professor of Medicine

### Dodgen Lecture

February 19, 2004



Dr. Herman A. Taylor, Jr., currently serves as Director and Principal Investigator of the new Jackson Heart Study, a landmark project sponsored by the National Heart, Lung and Blood Institute and the Office of Research on Minority Health of the National Institutes of Health. In that capacity, he holds appointments at Jackson State University, Tougaloo College, and the University of Mississippi Medical Center (Professor of Medicine). He received his undergraduate training at Princeton University and his medical degree from Harvard Medical School. Before completing his residency in internal medicine, he served 3 years in the Commissioned Corps of the Public Health Service in Miami, Florida. His work among the multi-ethnic population of inner city Miami solidified his career goal of working for improved health of American minority populations. After completing training in Internal Medicine at the

University of North Carolina at Chapel Hill and a cardiology fellowship at University of Alabama at Birmingham (UAB), he was appointed to the UAB faculty. At UAB he served as Attending Cardiologist at the University Hospital, the Birmingham Veterans Medical Center and the Cooper Green Hospital. Prior to his present appointment, he was Associate Professor of Medicine and Director of Cardiopulmonary Rehabilitation at the University of Alabama at Birmingham School of Medicine. During his 9 years on faculty at UAB, he established interests in preventive cardiology, acute coronary syndromes, and ethnic disparities in cardiovascular health. He also founded Heart to Heart – a non-profit organization, which provides cardiac surgical services for children from the developing world.

Dr. Taylor has published numerous research articles in renowned journals such as Hypertension, The New England Journal of Medicine, American Journal of Cardiology, American Journal of Epidemiology, Achieves of Internal Medicine and Circulation to name a few. During his career, Dr. Taylor has received several prominent recognition awards. The most recent awards include the Preventative Cardiology Academic Award from the National Heart, Lung and Blood (NIH, 1995), The American Heart Association Distinguished Service Award (1997–1998), the Best Doctors in America Award (2001–2002) and most recently the prestigious Daniel Savage Award for Excellence in Research (2003).

As leader of the Jackson Heart Study, he envisions helping create a better understanding of CVD among African-Americans as a guide to effective strategies to improve health and eliminate disparities. Furthermore, the Heart Study will improve the research capacity of its partner institutions while helping train future leaders in the sciences of health.

Dr. Taylor resides in the Jackson, MS area with his wife, Jasmine Pugh Taylor, and their 3 children: Mathew, Johnathan and Jaylen.

The Dodgen lecture is named in honor of Charles L. Dodgen, University of Mississippi Medical Center. Dodgen joined the Academy in 1959. He became executive officer in 1972, a post he held until his death in 1980.



**Thursday, February 19**  
**8:30–9:15 AM—Plenary Session I**  
Gulf Hall

**Audrey K. Tsao, M.D.**, Professor  
Department of Orthopaedic Surgery and Rehabilitation  
The University of Mississippi Medical Center  
Jackson, MS



Dr. Tsao received her Bachelor of Engineering Science in Biomedical Engineering and Materials Science for Johns Hopkins University in 1982. She attended Weill Medical College of Cornell University and received her M.D. in 1986. After completing her orthopaedic residency at Northwestern University – McGraw Medical in Chicago, she completed a fellowship in Arthritis and Total Joint Reconstructive Surgery at Johns Hopkins University Good Samaritan Hospital in Chicago. Dr. Tsao has published numerous articles and has lectured extensively on her specialties, as well as being actively involved in biological research. In 1994, she coordinated a total joint workshop and currently has multiple grants on total joints and osteonecrosis related research. Dr. Tsao has held a faculty appointment in orthopaedic surgery at Johns Hopkins

University before joining the University of Mississippi Medical Center and presently services on the Senate. A few of her professional memberships include the American Association of Hip and Knee Surgeons, the American Association of Orthopaedic Surgeons, National Osteonecrosis Foundation, the Orthopaedic Research Society, the Society for Arthritic Joint Surgery and the Society for Biomaterials.

Title: ORTHOPAEDICS AND ENGINEERING:  
THE CHICKEN AND THE EGG

Orthopedic principles of strain and stress and compressive forces for fracture fixation, piezoelectric bone healing and design of custom total joint replacements or rods and screws for fractures are primarily orthopedic science right? Or was that engineering for materials science, mechanical engineering and electrical engineering for that structure known as the human body. What about that monitor in the operating room for measuring oxygen levels or the electrical vectors of the heart. Didn't we just design that mobile device triggered by a puff of air to transport 200 LB mass 10 blocks that just happens to be a human body paralyzed from an auto accident? Engineering and orthopedics intimately related just pick the methods of personal interaction.

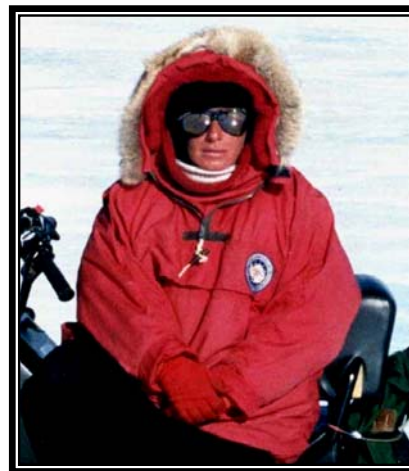
## Making the Case for Rapid Climate Change—Evidence and Implications

Thursday, February 19

12:00–12:40 PM—Plenary Session II

Gulf Hall

**Dr. Richard Alley and Dr. Joan Fitzpatrick**



This world we live in has kept excellent records of its past climate states in the rocks, sediments, and continental ice sheets. Through time, some of that excellent record is destroyed, but some, or at least enough, is preserved. This preserved record begs to be read so that its story and lessons may be known. With the present level of political and popular attention focused on climate change, it is important that science be called upon to present the facts as they are known and understood at this time of critical decision making.

Many scientists from all over the world are working on all aspects of climate change, its past and future. The Mississippi Academy of Sciences is very pleased to bring two such distinguished scientists to our Biloxi meeting.

Dr. Richard Alley is a worldwide recognized expert on the history of climate change, especially as seen through the record preserved in the ice sheets and glaciers of the Arctic, Antarctic, and Greenland. Dr. Alley is a professor at Pennsylvania State University in the Department of Geosciences. Besides his many professional papers, he has served on a variety of panels and steering committees for the National Science Foundation. He was

called upon to advise V.P. Al Gore on the climate change subject. His book, “The Two Mile Time Machine,” a development of the climate history found in continuous ice cores, is in its second edition. He was recently granted the highest academic rank bestowed at Penn State when he received an Evan Pugh Professorship for his work in glaciology.

Dr. Joan Fitzpatrick, currently the Deputy Director for the Central Region of the United States Geological Survey, designed and built the U.S. National Ice Core Laboratory. She has been intimately involved in the United States effort to unravel the mystery of climates past and their lessons for the future from the ice core records of Antarctica and Greenland. Among her many publications and professional presentations was a talk she gave to the Mississippi Geological Society several years ago. It was, without a doubt, one of the most informative and thought-provoking addresses the society has heard.

The combination of Dr. Alley and Dr. Fitzpatrick will be a wonderful opportunity for MAS to be informed on this fascinating subject.

**Friday, February 20**  
**12:00–12:40 PM—Plenary Session III**  
 Gulf Hall

**Dr. Joseph A. Cameron**, Professor and Director of Graduate Program  
 Director of Minority Institutional Research Training Program  
 Former Director of Community Mobilization, Jackson Heart Study  
 Director of the Bridges to the Baccalaureate Degree Program  
 Department of Biology, Jackson State University, Jackson, MS



Dr. Joseph A. Cameron received the Ph.D degree from Michigan State University in 1973. He currently holds the position of Professor of Biology at Jackson State University and has held this position since 1978. During his tenure at Jackson State University, Dr. Cameron has developed many graduate and undergraduate courses and has been appointed as coordinator of the graduate program since 1985. He has also served as Interim Dean, School of Science and Technology. Dr. Cameron's greatest contribution to Jackson State University is his desire to enhance and generate an interest in science throughout the educational pipeline, i.e. high school, junior college, college and doctoral degree levels. NIH has funded Dr. Cameron since 1985 to encourage students at these various levels. From 1986 to 2002, Dr. Cameron served as the Director of the Minority Institutional Research Training Program at Jackson State University. The program was sponsored by the National Heart, Lung, and Blood Institute and had an annual budget of 193,000 dollars. The program was a cooperative research-training project between Jackson State University and the University of Mississippi Medical Center. The primary purpose of the program is to identify, motivate, and train talented minority institutional pre-doctoral students. Dr. Cameron is also the former Director and Chief Administrator for the Community Mobilization component of the Jackson Heart Study. The program is sponsored by the National Heart Lung and Blood Institute in conjunction with the Office of Research on Minority Health. The program is a cooperative, interinstitutional, epidemiological study of cardiovascular

disease between Jackson State University, Tougaloo College and the University of Mississippi Medical Center. Dr. Cameron also serves as Director of the Bridges to the Baccalaureate Degree Program at Jackson State University. The program is sponsored by the National Institute of General Medical Sciences and has an annual budget of 200,000 dollars. The program is a cooperative research-training project between Jackson State University and Hinds Community College involving the Departments of Biology, Chemistry, Computer Science, Mathematics, and Physics. The program encourages Community College minority students to seek B. S and higher degrees. Dr. Cameron also serves as Coordinator of collaborative Bridges to the Doctorate Degree Program with Indiana University Purdue University at Indianapolis and the University of North Texas at Fort Worth. These are just a few of the many federally funded programs for which Dr. Cameron has served as director. Dr. Cameron is well respected at NIH and has served as Chair/Member of many Special Emphasis Panels at the National Heart, Lung and Blood Institute, National Institutes of Health, as well as Member of many Special Emphasis Panels at the National Center for Minority Health Disparities, National Institutes of Health. Dr. Cameron has also found time to publish as well as mentor students. He has published numerous journal articles and has produced over 40 Master level students. Dr. Cameron's goal is to serve his community through education.

Title: BRIDGES TO THE BACCALAUREATE  
 DEGREE PROGRAM: A METHOD TO  
 RECRUIT AND TRAIN THE NEXT  
 GENERATION OF BIOMEDICAL  
 ENGINEERING RESEARCH SCIENTISTS

The goal of the Bridges to the Baccalaureate Degree Program at Jackson State University and Hinds Community College is to facilitate the transition of underrepresented Community College students into Baccalaureate Degree Programs. The University of Mississippi Medical Center consults and assist program faculty with the provision of programs strategies, including academic enrichment activities, laboratory techniques and research experiences. Modern technological concepts, cognitive skills and diagnostic laboratory procedures in Chemistry, Computer Science and the Biological Sciences are reinforced in academic year activities.



The academic year component has been an effective preparatory strategy for summer research activities as indicated by student interest and mastery of biotechnological research techniques and concepts. A Southeastern Regional Bridges Research Conferences is held annually to allow students in participating Bridges Programs the opportunity to present research results before regional interstate peers and program faculty. Faculty, student and interstate peer assessment of student and program activities also reflect the success of academic enrichment and summer research-training activities. Additional program provisions include: curricular enrichment,

guest faculty lectureships, mentoring tutoring, counseling, senior college course credits and exposure to biomedical professionals. Activities are conducted on Saturdays during academic year and weekdays for eight weeks in the summer. The goal of the Bridges to the Doctorate Degree Program is to facilitate the transition of underrepresented masters level students to doctorate degree programs in the biomedical sciences at IUPUI and the University of North Texas at Fort Worth. Students are provided research support, mentoring, travel to scientific meetings and exposure to biomedical professionals at the doctorate and masters level institutions.

### Education Members

Organizations that assist the Mississippi Academy of Sciences in its efforts to promote science in Mississippi

Delta State University  
Jackson State University  
Mississippi Delta Community College  
Mississippi Gulf Coast Community College  
Mississippi Museum of Natural Sciences  
Mississippi State University

Mississippi Valley State University  
Mississippi University for Women  
University of Mississippi  
University of Mississippi Medical Center  
University of Southern Mississippi

### LIFE MEMBERS

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Robert Bateman, Hattiesburg, MS	Joan Messer, Sumrall, MS
John D. Bower, Jackson, MS	Jean-Pierre Montani, Jackson, MS
Carolyn R. Boyle, Starkville, MS	Lyle E. Nelson, Starkville, MS
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Charles T. Bryson, Stoneville, MS	Robin M. Overstreet, Ocean Springs, MS
C. Eugene Cain, Jackson, MS	Dudley F. Peeler, Jackson, MS
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C. T. Carley, Starkville, MS	John A. Pojman, Hattiesburg, MS
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Prentiss S. Cox, Clinton, MS	Dero S. Ramsey, Starkville, MS
Crayton M. Crawford, Mississippi State, MS	Robin W. Rockhold, Jackson, MS
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## **Research Opportunities**

### **Mississippi Functional Genomics Network funded by NIH-NCRR**

Funding currently available for Research Experience Opportunity (REO) in Mississippi:

- ✓ **Summer biomedical/biotechnology research**
- ✓ **Living/Travel Expenses**
- ✓ **Supply money for Host Laboratory**

MFGN is an initiative funded by the National Institutes of Health to facilitate biomedical research in Mississippi. In addition to funding opportunities, MFGN has five research facilities with state-of-the-art equipment available for use by scientists in Mississippi, including:

- ✓ **Genomics Facilities**
- ✓ **Proteomics Facility**
- ✓ **Imaging Facility**

Be sure to visit the MFGN Web site ([mfgn.usm.edu](http://mfgn.usm.edu)) that now includes a message board and chat room to keep you aware of recent developments.

#### **For further information contact**

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## ***OUR CLIMATE IS CHANGING IT COULD BE A ROUGH RIDE***

The Geology and Geography Division is pleased to announce a symposium on Thursday from 1:00 to 4:00 pm on climate change



The history of climate change for the past 100,000 years is well preserved in the continental ice sheets as well as in sediments. An analysis of all the data shows the characteristics or behavior of past changes. If these well documented past changes are viewed as a window through which we see our future circumstances, we would do well to consider how rapid and large these changes could be. Does our future look like a gentle trail horse or a bucking bronco?

This will be a world class review by world renowned experts on the subject of climate change, Dr. Joan Fitzpatrick and Dr. Richard Alley.

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### **Division of Mathematics, Computer Science and Statistics Mississippi Academy of Science**



#### **Workshop: Analysis of Bio-Statistical Data**



This workshop will focus on various techniques of analyzing statistical data with particular reference to bio-statistics.

*First Session:* Design of Experiment, Analysis, and Interpretation Using SAS

Presenter: Dr. Elgenaid I. Hamadain, Biostatistician & Assistant Professor, Dept of Biology, JSU

*Second Session:* Analyzing Data Using Information Superhighway

Presenter: Dr. Todd G. Nick, Professor and Biostatistician, University of Mississippi Medical Center

*Third Session:* Statistical Analysis With Hand-Held Technology

Presenter: Mrs. Kanchan Manaktala, Dept of Mathematical Sciences, Alcorn State University



## *Mississippi Junior Academy of Science*

<http://www.mjas.org/>

### **2004 Competition Information**

The annual MJAS competition will be held on February 18, 2004, at the Mississippi Gulf Coast Community College – Jefferson Davis Campus in Gulfport, MS in conjunction with the Mississippi Academy of Sciences annual conference. If you are interested in serving as a judge for this competition, please contact Aimée Lee at (601) 266-6374 or [aimee.lee@usm.edu](mailto:aimee.lee@usm.edu) or visit the new MJAS website: [www.mjas.org](http://www.mjas.org).

### **2003-2004 MJAS Executive Board**

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Secretary:	Rachel Wheeler <a href="mailto:raewheel@yahoo.com">raewheel@yahoo.com</a> Cleveland High School	
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## What is the Competition?

The most important thing to remember about the MJAS Annual Research Paper Competition is that the paper must be based on a scientific study where students manipulate variables in order to develop data.

There are two classes into which competitors are divided: Class I is 9<sup>th</sup> and 10<sup>th</sup> grade students; Class II is 11<sup>th</sup> and 12<sup>th</sup> grade students. Papers are then grouped into appropriate divisions based on the topics of research.

The annual research paper competition has three phases: (1) written paper competition, (2) oral presentation competition in divisions, and (3) overall competition.

The Written Paper Competition is the first phase of the competition. In order to make a presentation at the annual meeting of the Mississippi Junior Academy of Sciences, participants must submit their research papers for review. This part of the competition is based on the quality of the research paper. Because of this, it is important to know what the judges look for in a paper. Be sure to include the following in the paper: title page, abstract, purpose, method, results, conclusions, and references.

The judges will look for a clearly identified research problem and a thorough description of the experimental procedures. Quantitative data should be neatly arranged and easy to understand. Qualitative data should be explained clearly. Results of the experiment should be interpreted in a discussion of the significance of the results. In addition, a literature review is also recommended.

From the submitted written papers, the judges select those that are to be presented at the oral presentation competition.

The Oral Presentation Competition judging criteria are based on the professional aspect of the presentation, including the support material and poise of the presenter. Supporting materials include, but are not limited to, the following: slides, posters, transparencies, models, computer generated presentations, etc. The effective use of audio-visual materials is instrumental in the oral presentation.

In this phase of the competition, judges do not consider the written paper, only the presentation itself. Judges look for confidence in the presenter, the ability of the presenter to maintain audience interest, appropriate voice level, appearance, clarity of diction, and enthusiasm for the topic.

The Overall Competition brings together the divisional winners of Class II. These students present their papers before their peers and another panel of judges. Again, the judges select the Clyde Sheely Award winner and the Second Place winner based on the students presentation alone. The written work is not considered in this phase of the competition.

## AGRICULTURE AND PLANT SCIENCE

Chair: Juan L. Silva, Mississippi State University  
Vice-chair: O.P. Vadhwa, Alcorn State University

### THURSDAY MORNING

#### Caribbean

9:15 Introduction

9:30 HYPERSPECTRAL REMOTE SENSING OF INVASIVE WETLAND PLANTS

Tami Wells\* and Gregory A. Carter, University of Southern Mississippi, Hattiesburg, MS 39406, and Gulf Coast Geospatial Center, Ocean Springs, MS 39564

Hyperspectral image data were used as a baseline for mapping wetland plant species with emphasis on the detection of invasive plants in Northern Mobile Bay. Reflectances of wetland plant species were acquired from imagery collected by the airborne ITD VNIR 10E Hyperspectral Sensor developed by the Institute for Technology Development at Stennis Space Center. Image data collected through the visible to near infrared spectrum (350–1050 nm wavelengths) were evaluated to determine characteristic spectral signatures of indigenous and non-indigenous plant species important to the structure and dynamics of the estuary. Spectral signatures were significant in delineating the diversity among native wetland plants and detecting invasive species. Results indicate that hyperspectral imagery can be extremely effective in detecting and monitoring invasive plant populations and overall plant biodiversity in a critical coastal ecosystem.

9:45 SENSITIVITY ANALYSIS OF HYDROLOGIC MODEL PARAMETERS FOR THE ST. LOUIS BAY WATERSHED

Z. Liu\*, W.L. Kingery, V.J. Alarcon, and D.H. Huddleston, Mississippi State University, Mississippi State, MS 39762

The application of physically based models such as Hydrologic Simulation Program-Fortran (HSPF) to real watersheds requires a larger number of parameters to be estimated for the purposes of model calibration. Sensitivity analysis is a very effective method to screen for the more sensitive parameters in order to provide guidelines for more efficient calibration efforts. Sensitivity analysis was employed to study four HSPF model output variables: streamflow, surface runoff, interflow outflow, and active groundwater outflow. Fourteen HSPF hydrologic input parameters have been examined under five different simulation scenarios for the St. Louis Bay watershed. For each of the parameters, a normalized

sensitivity coefficient has been calculated to determine the degree of sensitivity of the output variables to it. Additionally, the interaction between input parameters was evaluated. Through our research, the critically sensitive parameters for each of the four model outflow variables used in the simulation of the Bay St. Louis watershed hydrology.

10:00 BERMUDAGRASS SEEDLING GROWTH IN DRASTICALLY ALTERED AND AMELIORATED SOIL

R.M. Stout\*, W.L. Kingery, M.E. Zappi, and J. Harden, Mississippi State University, Mississippi State, MS 39762

Fenton's reagent, which contains hydrogen peroxide and an iron catalyst, is used in remediation of soils and waste-waters contaminated with organic compounds. Because Fenton is such a powerful oxidant, there is a concern that soils remediated using this treatment are rendered infertile. The objective of our work was to evaluate bermudagrass (*Cynodon dactylon*) germination and seedling vigor as influenced by various ameliorants on Fenton-treated soils. We treated an uncontaminated Alfisol with Fenton's Reagent and incorporated different soil amendments into the pots. The soil ameliorants include: (1) Hu-More™ with alfalfa, (2) mycorrhizal spores, (3) a commercially available concoction of microorganisms (Equity™), (4) Equity plus humates, and (5) earthworms. Other treatments included various combinations of these five. Bermudagrass seeds were planted in pots containing ameliorated soils and kept watered in a greenhouse for two weeks. Data collected included: days to emergence, leaf blade length and width, internode length, root and shoot fresh weight, dry weight at harvest, soil pH, extractable soil nutrients and other fertility-related variables. Soil treated with Fenton's requires amelioration in order to make it fertile and capable of supporting plant growth. Treatments with a combination of ameliorants 1, 2, 4, and 5 produced the highest soil pH with a mean of 7.7; the natural soil pH was 5.2 and the Fenton-treated pH was 4.4. Ameliorant 2 had the highest shoot and root dry weight.

10:15 EFFECT OF PLANT SPACING ON THE GROWTH AND QUALITY OF LEMONGRASS (*CYMBOPOGON CURATES*)

Stephen Asumeng<sup>1\*</sup>, Patrick E. Igboke<sup>1</sup>, Dovi Alipoe<sup>1</sup>, Liang Huam<sup>1</sup>, Magid Dagher<sup>1</sup>, Charles Burandt<sup>2</sup>, and Larry Russell<sup>1</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096, and <sup>2</sup>University of Mississippi, Oxford, MS 38677

Field experiments were used to determine the effect of three plant spacings (30.0, 45.0, and 60.0 cm) on lemongrass (*Cymbopogon curates*) growth potential and quality. These studies were conducted on a Memphis silt loam soil at the Alcorn Experiment Station: Field plot design was a randomized complete block (RCB) with four replications of each spacing (treatment). Plant growth was based on the above- and below-ground growth parameter productions, whereas, quality was based on the leaf-essential oil compositions. Mean values for

plant width, and number of tillers per plant were significantly highest (1.22 m and 35.75 tillers, respectively) at 45.0 cm spacing, and lowest (0.91 m and 27.75 tillers, respectively) at 30.0 cm spacing. Mean weights for the aboveground plant biomass per row was significantly highest (30.5 kg) at 30.0 cm spacing, but was not different from 27.3 kg reported at 45.0 cm spacing. Root weight per plant was significantly highest (0.61 kg) at 60.0 cm, compared to 0.43 kg reported at 30.0 spacing. Percent essential oils (citral, geraniol, geranial, and neral) were generally highest at 45.0 cm spacing and lowest at 60.0 cm spacing.

10:30 Break

10:45 THE USE AND RESULTS OF A STRUCTURED COHERENT ELECTROMAGNETIC FIELD ON PRODUCTION PARAMETERS WHEN APPLIED IN COMMERCIAL EGG-LAYING CHICKENS

Robert W. Keirs\* and E. David Peebles, Mississippi State University, Mississippi State, MS 39762

Electromagnetic field (EM field) units were equally spaced when installed in typical commercial layer houses that were located in the same geographical area and under the same management program. The same breed of egg layers was utilized in two different houses during the production phases for a total of five separate flocks housed chronologically from August 23, 1997, through October 6, 2003. Number of eggs laid per each hen housed (E/HH) and hen mortality per day (HDM) were monitored up to 60 weeks of bird age. The E/HH and HDM of the birds subjected to EM fields were compared to respective commercial standards that represent a reasonable genetic potential under optimal conditions [referred to as 'Breeder Goals' (BG)]. In four flocks subjected to EM fields, E/HH was 1.58, 7.09, 6.61, and 7.66% higher than BG to 60 weeks of age. For the fifth flock, E/HH was increased by 1.43% over BG to 56 weeks of age. The HDM of the first four flocks subjected to EM fields was 36.57, 51.26, 30.13, and 44.10% lower than BG to 60 weeks of age. For the fifth flock, HDM was decreased by 24.57 under BG to 56 weeks of age. Overall, these data suggest that the influence and utilization of EM fields in intensified animal agriculture should be considered and studied.

11:00 QUALITY RETENTION OF SELECTED FRESH-CUT VEGETABLES AS AFFECTED BY CUTTING METHOD

Lorena Albuja\*, Taejo Kim, and Juan L. Silva, Mississippi State University, Mississippi State, MS 39762

Fresh-cut vegetables have become a rapid-growing segment of the US fresh produce industry. These products have the attributes of convenience and fresh-like quality. While conventional food processing methods extend shelf-life of vegetables, minimal processing renders them highly perishable. Minimal processing can be performed either manually with

knives or mechanically with commercial slicing machines. The effect of manual and machine processing on quality retention of selected vegetables, simulating a foodservice process, were evaluated. Machine cut processing significantly reduced overall quality of tomatoes. In the case of mushrooms, lettuce, cabbage and cauliflower, hand cut samples quality was higher than machine cut samples, but only during the first days of storage; whereas in the case of onions, celery and carrots, the type of cutting did not have any effects. Microbial load of hand cut was lower than for machine cut in cauliflower. Yeast and mold counts differed for hand and machine cut cauliflower, cabbage and celery. Hence, the type of cutting affects quality retention depending on the product, apparently due to differences in the amount of damage incurred. In general, acceptable quality of hand and machine cut products can be retained for three days in a foodservice environment. It is recommended that tomatoes be processed with sharp stainless steel knives to minimize tissue disruption.

11:15 GASEOUS STORAGE EFFECT ON FRUIT QUALITY AND SHELF LIFE OF BLUEBERRIES

Angsana Tokitkla\*, Juan L. Silva, Taejo Kim, and Frank B. Matta, Mississippi State University, Mississippi State, MS 39762

In recent years, the detection of outbreaks of food-borne illnesses has increased. The main food-borne pathogen in fruits and vegetables are *E. coli* O157:H7 and *Salmonella*. There are many methods used to reduce these on fruits. Wetting the blueberries in an aqueous solution result in higher fruit decay and cause extra handling and expense of drying them. Therefore, this experiment was set up to examine the effectiveness of ozone, SO<sub>2</sub> and CO<sub>2</sub> (in gas form) in extending the shelf-life and quality of rabbiteye blueberries (*Vaccinium ashei*). Fruits were placed in clamshells. The packages were loaded in hermetically sealed containers, and fumigated every sampling time with ozone, 193 ppm SO<sub>2</sub>, 20% CO<sub>2</sub>, or normal air. Boxes with fruit were stored at 2 °C and sampled periodically for 40 days. Fruit decay was higher for berries stored in the control treatment than it was for berries stored in ozone, SO<sub>2</sub> and CO<sub>2</sub>. Weight loss did not differ between treatments, while acidity decreased especially in SO<sub>2</sub> berries and firmness higher in ozonated berries. Panelists preferred berries stored under ozone or CO<sub>2</sub> after 41 days. Ozone and SO<sub>2</sub> can therefore be considered as gases used in MAP to extend the shelf life and inhibit the pathogenic bacteria for blueberries.

11:30 INFLUENCE OF SURFACE TREATMENTS AND STORAGE TEMPERATURE ON SHELF LIFE AND QUALITY OF RABBITEYE BLUEBERRIES

Jelena Stojanovic\*, Juan L. Silva, Chonthida Kaewplang, and Youkai Lu, Mississippi State University, MS 39762

Mississippi ranks seventh among blueberry producing states in the nation. Most of the 4 million tons produced in 2001 were marketed as a fresh fruit. This kind of marketing

imposes a shelf life issue, and with that an economic problem, taking into account the perishable nature of the fresh blueberries. The objective of this study was to evaluate different treatments and storage temperatures on shelf-life and quality of rabbiteye (*Vaccinium ashei*) blueberries. Fresh picked blueberries were packed untreated (control) or treated with 100ppm chlorine solution and with Tsunami (40 ppm peroxyacetic acid) for 30s, air dried and placed in plastic clamshells. Samples were stored at 2–3 °C (RF) and part at the room temperature, RT (21 °C), and evaluated every five days for up to 40 days. Samples were analyzed for texture, weight loss, color, total anthocyanins, total phenolics, yeast and molds, aerobic plate and psychotropic plate counts. Color and firmness changes were more prominent on RT berries. After 25 days, RT berries lost 24–36% of their total weight, while RF berries lost 10–15% of their weight after day 40. Changes in anthocyanins and phenolics were evident after 10 days, regardless of storage temperature. A 2-log increase in microbial counts was recorded for RT berries regardless of treatment after 5 days. Chlorine solution was most efficient in reducing microbial counts on berries. Refrigeration of blueberries seems to be more important than pretreatment in extending shelf-life and maintaining quality of blueberries.

## THURSDAY AFTERNOON

### Caribbean

#### 1:00 BEST INCUBATION TEMPERATURE FOR PREDICTING MICROBIAL LOAD AND SPOILAGE OF CATFISH

Youkai Lu\*, Juan L. Silva, and Taejo Kim, Mississippi State University, Mississippi State, MS 39762

Aerobic plate counts (APC), incubated at 35 °C, and psychrotrophic plate counts (PPC), incubated at 20 °C, are commonly used as an index to reflect the microbiological quality and predict shelf-life of farm-raised channel catfish (*Ictalurus punctatus*) during processing and storage. The objectives were to compare the changes in APC and PPC and their correlation with overall sensory scores, of refrigerated catfish fillets stored at 0 °C and 4 °C. The PPC and APC on fillets stored at 0 °C had about four and six days lag phase, respectively. The PPC on fillets stored at 4 °C did not show any lag phase and grew rapidly; while APC of fillets stored at 0 °C had two days of lag phase. The APC were always over 1 log lower than PPC at each storage period. But the difference was higher from fillets stored at 0 °C than from fillets stored at 4 °C. Thus, APC incubated at 35 °C are not a good procedure to reflect microbiological quality of catfish. But PPC incubated at 20 °C could be a better indicator of catfish shelf-life, reflecting microbiological quality of catfish during refrigerated storage.

#### 1:15 THE EFFECT OF OZONE AND CARBON DIOXIDE MODIFIED ATMOSPHERE STORAGE ON

## PATHOGENS OF CATFISH FILLETS

Somsamorn Gawborisut\* and Juan L. Silva, Mississippi State University, Mississippi State, MS 39762

Catfish growers in the 13 producing states had sales of 385 million dollars during 2001. Mississippi produces about 60% of the catfish in the United States. Overall sales of catfish products were down in 2001, but sales of fresh catfish products rose 3.5% in 2001. Most of the increase in sales of the fresh catfish products was due to a 9.5% increase in fresh catfish fillets. The U.S. FDA has not approved most seafood products be packaged and distributed under modified atmosphere package (reduced oxygen), unless the temperature can be controlled throughout their life. Modified atmosphere storage (MAS), a supplemental technique to refrigeration, may be a feasible alternative to extend shelf life of fresh catfish fillets. Growth of *Listeria monocytogenes* and *Salmonella typhimurium* as affected by atmospheric conditions (100% carbon dioxide, ozone atmosphere, and air) and storage time were investigated. Growths of the pathogens (inoculum size of 10<sup>4</sup> cfu/g of catfish fillet) were slightly reduced by ozone and 100% carbon dioxide after four days storage. Even though ozone is a powerful oxidizing agent and carbon dioxide can suppress several genera of bacteria (bacteriostatic), rough surface and composition of the fillets may protect the bacteria from contact with the gases. Additional methods such as irradiation or chemical treatments may be required to reduce initial load in catfish fillets and increase MAS effectiveness.

#### 1:30 Divisional Poster Session

#### BIOACCUMULATION OF CADMIUM IN WHEAT PLANTS

P. Kumar, K.L. Shumaker, and M. Zaman\*, Mississippi School for Mathematics and Science, Columbus, MS 39701; Jackson State University, Jackson, MS 39217; and Alcorn State University, Alcorn State, MS 39096

The tolerance of wheat plant (*Triticum sativum*) to soil cadmium (Cd) and bioaccumulation of Cd in plant tissue were evaluated. Plants were grown under color corrected lights in soils containing 0, 500, 1000, and 2000 ppm Cd. Plants were harvested on day 30 of the experiment and dried plant samples were acid digested for tissue Cd analysis. Tissue Cd accumulation was performed using an atomic absorption spectrophotometer. Data were analyzed for plant biomass, growth inhibition, and Cd accumulation in plant tissue. Results indicated that wheat plants were able to tolerate high Cd concentration in soil, and plant biomass production, growth inhibition, and bioaccumulation of Cd in plant tissues were dose related. Plant Cd accumulations were 59% and 83% higher than the 1000 ppm and 2000 ppm Cd concentrations in soils respectively. Overall data indicated that *T. sativum* is a Cd hyperaccumulator and can be used for phytoremediation of Cd contaminated soil.

# SOIL MICROBIAL ACTIVITY AND POPULATION RESPONSES TO HEAVY METAL AND SHELTYE AMENDMENTS

M.T. Begonia\*, G.B. Begonia, G. Miller, D. Gilliard, and C. Young, Jackson State University, Jackson, MS 39217

Little is known about in situ microbial community responses to heavy metal stress. Such study is necessary before remediation of heavy metals from contaminated soils can be effectively pursued. The objectives of this study were to quantify soil phosphatase activity and microbial populations of a heavy metal- and chelate-amended soil that had been previously cropped with wheat for six weeks. Results revealed that phosphatase activity generally decreased with increasing level of soil-applied lead (Pb) and cadmium (Cd). This decrease in microbial activity was more pronounced in the presence of chelates. Results also indicated that bacteria were not inhibited by Pb since soils treated with the highest Pb level had the highest bacterial population. Cd was extremely inhibitory to bacteria as exhibited by the significantly low bacterial numbers at all Cd treatments compared to the control. Fungi were more sensitive to Pb as shown by the significant decrease in fungal population especially at the highest Pb treatment. EDTA alleviated the toxic effect of the lowest Pb treatment on fungal population. Cd did not inhibit fungal proliferation since fungal population increased with increasing level of applied Cd. The resistance of soil bacteria and fungi to soil-applied Pb and Cd indicates that these microorganisms may have resistance mechanisms to deal with metal toxicity.

# EFFECTS OF CHELATE APPLICATION TIME ON THE PHYTOEXTRACTION OF LEAD-CONTAMINATED SOILS

G.B. Begonia\*, M.T. Begonia, and G. Miller\*, Jackson State University, Jackson, MS 39217

Chelate-assisted phytoextraction has been proposed as an effective tool for the phytoremediation of heavy metal-contaminated soils. However, chelate-enhanced metal leaching could also lead to secondary pollution. Therefore, greenhouse studies were conducted to determine the effects of chelate application time on the phytoextraction of lead (Pb) by a high biomass crop. Two wheat (*Triticum aestivum* L. cv. TAM-109) seeds were sown in each 150 mL tube containing a growth medium (sieved soil and peat, 2:1, v:v) that had been spiked with either 1,000 or 2,000 mg Pb/kg dry medium. Chelates were also applied to the Pb-spiked growth medium either before planting (i.e., early-season application) or at 42 days after planting (i.e., mid-season application). After six weeks of growth, plants were harvested at 0, 3, and 7 days after mid-season chelate application corresponding to 42, 45, and 49 days after planting (DAP), respectively. Results showed that Pb translocation to the shoot was greatest at 3 days after mid-season application (45 DAP) compared to an early season application. These results imply that chelates can be applied when plants have attained maximum biomass then harvested a few days later thereby avoiding the possibility of a chelate-

induced metal movement into the ground water.

# ON-FARM ASSESSMENT OF THE EFFECTS OF RICE WATER WEEVIL CONTROL ON YIELD FACTORS OF RICE

B.C. Owens<sup>1\*</sup>, W.L. Kingery<sup>1</sup>, T.W. Walker<sup>2</sup>, and J.E. Street<sup>2</sup>,  
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On-farm experimentation involves a much larger matrix of interacting factors than does research under highly controlled conditions in the greenhouse or on agricultural research stations. For this reason testing hypotheses related to agronomic practices under actual production environments is critical to their appropriate evaluation. Control of rice water weevil (*Lissorhoptrus oryzophilus*), which is the most destructive insect pest of rice (*Oryza sativa*) in the U. S., was evaluated on fields located in Washington, County. Cocodrie variety seeds that were either treated with 6.2 FS Fipronil or left untreated were sown in separate areas in each of three fields. In four randomly selected sites within each treatment, data were collected weekly on pest activities (e.g., rice water weevil counts, weevil feeding, and plant damage) and agronomic traits (plant height, joint movement, tillering, boot stage, etc.). In addition, careful records of crop management were made. Despite complex interactions over time and space of pests, climate, soils, and management, careful mapping of rice yield factors under a scientifically sound protocol allows for the development of reliable conclusions regarding cultural practices.

# EFFECT OF FERTILIZATION APPLICATION ON PRODUCTION AND LEAF MICRONUTRIENT ELEMENTAL CONTENT OF MALABAR SPINACH (*BASELLA ALBA* L.)

O.P. Vadhwa<sup>1\*</sup>, D.A. Marshall<sup>2</sup>, and J.M. Spiers<sup>2</sup>, <sup>1</sup>Alcorn State University, Lorman, MS 39096, and <sup>2</sup>USDA-ARS Small Farm Fruits Research Station, Poplarville, MS 39470

The effects of four fertilizer treatments on yield, plant growth parameters, and leaf elemental micronutrient content of 'Malabar' spinach (*Basella alba* L.) were evaluated in a Ruston fine sandy loam soil (fine-loamy, siliceous, thermic Typic Paleudult) at the USDA Small Fruits Research Station in Poplarville, MS. Fertilizer (13-6-11) treatments consisted of (1) 112 kg/ha applied twice during the season (June and August) for a total of 224 kg/ha, (2) 112 kg/ha applied four times during the season (June, July, August, September) for a total of 448 kg/ha, (3) 224 kg/ha applied twice for a total of 448 kg/ha, and (4) 224 kg/ha applied four times for a total of 896 kg/ha. Plant growth was positively correlated with total N applied regardless of application timing. Leaf yield followed the same pattern as total plant growth, except frequent N applications was as important as total applied N. Leaf size was smallest with the 224 kg/ha per year N fertilization rate. Nitrogen rates of 448 to 896 kg/ha per year did not result in different leaf size regardless of the number of applications. Leaf Fe concentrations were

decreased as levels of N fertilizations were increased. Similar trend was also observed for B concentration in leaves. N fertilization rates had no effect on leaf concentration of Mn, Zn, and Cu.

#### CONSUMER RESPONSE TO VALUE ADDED FISH MINCE PRODUCTS

Susan DeBlanc\* and Linda S. Andrews, Mississippi State University, Mississippi State, MS 39762

Two species of underutilized Gulf of Mexico fish were analyzed for their suitability and consumer acceptability for value added seafood products. Chub mackerel (*Scomber japonicus*) and hard head catfish (*Arius felis*) minces were prepared by washing raw mince at varying pH. Previous results showed that Chub mackerel mince is high in protein and low in fat content and has potential for production of raw surimi or mince-based value added products. Fish mince cakes and fish meatballs were prepared and served to consumer panelist for sensory survey. Consumer volunteers were recruited from local "festivals" in South Mississippi. Consumer acceptability of fish mince cakes has been very favorable (7.4–7.8 acceptability for mackerel and catfish, respectively).

#### Divisional Lecture

##### 2:30 PROTEOMICS: NOT JUST ANOTHER OMICS

H. Alan Wood, Mississippi State University, Mississippi State, MS 39762

Proteomics has emerged as one of the most powerful tools in the biotechnologies. A proteome is the complement of proteins present in an organism, organ, cell, or organelle at a specific point in time under a specific set of conditions. The term proteomics has come to convey differences in proteomes. These differences can result from cell cycle state, nutrient and growth conditions, pathological disorders, environmental responses, etc., etc. Accordingly, proteomics has become a valuable tool in medical, agricultural and environmental studies. The Life Sciences and Biotechnology Institute at MSU has established a proteomics core facility. It is available to all faculty and students of Mississippi universities and colleges as well as Mississippi companies. The nature and utility of the equipment will be discussed along with the various proteomic technologies that can be used to solve your biological problem quickly and easily.

##### 3:00 Divisional Business Meeting

#### CELLULAR, MOLECULAR AND DEVELOPMENTAL BIOLOGY

Chair: Yuan Luo, University of Southern Mississippi

Vice-chair: Mary L. Haasch, University of Mississippi

#### THURSDAY MORNING

Caprice

#### Section I The DNA World

##### 9:30 CONSTRUCTS FOR INVESTIGATING THE EFFECT OF INTERFERON RESPONSE ELEMENTS ON THE EXPRESSION OF MAREK'S DISEASE VIRUS PP38 GENE

Ann-Marie Ziegeler<sup>1</sup>\*, Ross Whitwam<sup>1</sup>, and Shane Burgess<sup>2</sup>,  
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<sup>2</sup>Mississippi State University, Starkville, MS 39762

Marek's disease (MD) virus (MDV) is a lymphomagenic herpesvirus of chickens. MD is a biomedical model for human lymphomagenesis. A 38 kiloDalton MDV gene product, phosphoprotein 38 (pp38), is critical to MDV's life cycle and is unique amongst herpesviruses. Pp38 is postulated to have evolved in response to chicken interferons. TransFac database searches reveal the pp38 promoter has two interferon response element (IRE) consensus binding sites. To determine whether these IRE sites are functional, reporter constructs are being created. The expression vector used is pd2EGFP-N1, which encodes green fluorescent protein (GFP) 3' of the multiple cloning site (MCS). The constitutive cytomegalovirus (CMV) promoter is 5' to the MCS. The promoter was excised from pd2EGFP-N1. Three regions of the pp38 promoter were amplified by PCR. The first is immediately proximal to the transcription start site and includes no IRE sites. The second extends 5' to include one IRE site. The third extends further 5' to include both IRE sites. Optimizing primer design for the PCRs was not trivial. Desired promoter fragments were amplified and all three amplicons will be inserted 5' of the GFP gene replacing the CMV promoter. Each construct will be transfected into chicken embryo fibroblasts to determine the effects of the IRE sites on pp38 expression in differing concentrations of interferon.

##### 9:45 EXAMINATION OF CARBOXY SOME GENE STRUCTURE IN *THIOMICROSPIRA CRUNOGENA*

Kristi Budzinski\*, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406

Most chemoautotrophic bacteria and all cyanobacteria contain carboxysomes, polyhedral inclusion bodies that

enhance the fixation of carbon dioxide by ribulose-1,5-bisphosphate carboxylase/oxygenase. The carboxysome genes of most chemoautotrophic bacteria are arranged in a putative operon (*cso*), whereas the carboxysome genes of cyanobacteria, *ccmKLMN*, are only loosely clustered. The arrangement of carboxysome genes in *Thiomicrospira crunogena* as examined in this study. *T. crunogena* is an obligate chemolithoautotroph found in deep sea hydrothermal vents in the East Pacific Rise. Electron microscopy of *T. crunogena* revealed that the bacteria contain *cso*-type carboxysomes, like other chemoautotrophs. However, the carboxysome polypeptide composition of *T. crunogena* differs from that of other chemoautotrophic bacteria such as *Halothiobacillus neapolitanus*. Southern blotting will be performed to determine the gene cluster organization.

## Section II The RNA World

### 10:00 RIBOZYME-CATALYZED AMINOACYLATION FROM ACETYL COA

Na Li\* and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

According to the RNA world hypothesis, the evolution of coded protein synthesis was a critical step in the transition from the RNA world to our contemporary biological systems. Evolution in the RNA world would have resulted in ribozyme-catalyzed acyl-transfer reactions, from which coded protein synthesis would have then been evolved. Therefore, an RNA-only-based protein synthesis system would require a set of RNA molecules capable of synthesizing aminoacyl-RNAs, which are produced by the protein aminoacyl-tRNA synthetases in extant biology. We report a new class of highly efficient ribozymes generated by directed in vitro evolution that can catalyze the aminoacylation from aminoacetyl CoA. Thioesters of coenzyme A (CoA) play a prominent role in living cells by serving as essential intermediates in numerous metabolic processes. With its "high-energy" thioester bond yet sufficient chemical stability, a thioester is an excellent intermediate for acyl group transfer reactions. In contrast to tRNA aminoacylation from aminoacyl adenylates, thioester-activated amino acids are used in current work as the substrates to mimic the tRNA charging catalyzed by protein aminoacyl-tRNA synthetases in modern biological systems. Combined with our previously isolated ribozymes that make CoA and its thioesters, the isolation of this new class of ribozymes lends further support to the hypothesis that thioesters of coenzyme A could have played a key role in biological evolution and provides clues to the complexities of the RNA world.

### 10:15 SOLID-PHASE SYNTHESIS OF DOUBLE FLUORESCENT-LABELED RNA BY cDNA-SPLINTED LIGATION

Guocan Wang\* and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

Fluorescence resonance energy transfer (FRET) is a

spectroscopic method that provides distance information on macromolecules in solution in the range 20–100 Å. It is therefore a suitable probe to determine distances in RNA molecules and analyze their global structure. Fluorescence resonance energy transfer has been applied successfully in the structural investigation, real-time kinetics of conformational changes, monitoring ion binding, and thermodynamic stability analysis of different conformers. Site-specifically labeling RNA with fluorophores is critical for FRET and current methods for synthesis of fluorescent RNA depends heavily on solid-phase chemical synthesis, which is limited by coupling efficiency of solid-phase synthesis and availability of stable phosphoramidites for solid-phase synthesis. We describe a simple method to prepare fluorescent RNA for FRET on solid-phase matrix, thiopropyl 6B beads. A large RNA molecule is divided into three parts, which are transcribed individually using adenosine-derivatives as initiators. The 5' end piece was initiated with dephos-coenzyme A, which can be immobilized on thiopropyl 6B by a disulfide bond. The middle RNA piece is initiated with N6-HDA-AMP, and can be ligated to the first RNA piece by a cDNA-bridged ligation method. Reaction of the N6 amino group of the labeling site with fluorescein succinimidyl ester produces site-specific labeling. In the same way, the 3' end RNA piece can be ligated to first two RNA pieces. Reaction with the second fluorophore, cyanine 3, complete the process of dual fluorophore-labeling. This solid-phase based RNA labeling procedure should enable simple and efficient preparation of fluorescent RNA for FRET study.

10:30 Break

### 10:45 COENZYME SYNTHESIS AND UTILIZATION BY RNA AND THE RELATIONSHIP BETWEEN RIBOZYME SIZE AND CATALYTIC ACTIVITY

Tricia Coleman\*, Guocan Wang, Na Li, and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

A novel adenosine-initiated transcription system based on the T7 class II promoter  $\phi$  2.5 has been developed to explore the ability of RNA to utilize adenosine derivatives in RNA catalysis. First, we have isolated ribozymes that can catalyze the formation of CoA, NAD and FAD from their respective precursors (phosphopantetheine, NMN, and FMN), suggesting a plausible mechanism of coenzyme synthesis and utilization in the RNA world. Since these coenzymes all contain an adenosine moiety, we have exploited our adenosine-initiated transcription method to incorporate CoA, NAD and FAD onto the 5'-ends of RNA transcripts to explore a broadened functional capacity of RNA. The CoA-initiated transcription method has been used to isolate a series of thioester synthetase ribozymes. This work is currently being extended to include the isolation of ribozymes capable of peptide synthesis from acyl CoA thioester intermediates. All of the ribozymes described above are linked by an overall scheme, where the multiple chemical steps required to synthesize peptide bonds

from thioester intermediates would constitute a synthetic pathway catalyzed by a series of individual metabolic ribozymes in an entirely RNA-based metabolic pathway. Both the coenzyme synthetase ribozymes and the thioester synthetase ribozymes were isolated from a size heterogeneous RNA pool containing RNA with random regions of 30, 60, 100, and 140 nucleotides. In addition, we have isolated several ester synthesizing ribozymes from the same heterogeneous pools. Comprehensive kinetic analyses have been conducted on these ribozymes and there appears to be an optimal catalytic size around 60 nucleotides. Our work may provide significant insight into the RNA world complexity and the origin and evolution of coenzymes.

#### 11:00 ISOLATION OF NOVEL RIBOZYMES WITH THIOESTERASE ACTIVITIES

Danning Huang\* and Faging Huang, University of Southern Mississippi, Hattiesburg, MS 39406

In a hypothesized RNA world, all essential biochemical reactions would have to be catalyzed by RNA enzymes, or ribozymes. First discovered in living systems, ribozymes can also be isolated from artificial random RNA libraries, thanks to the development of powerful in vitro selection techniques. Many ribozymes with a variety of activities have been isolated during the past decade. In our work, we are trying to link different ribozymic activities to form metabolic pathways—RNA-based metabolic pathways. A series of ribozyme activities involving coenzyme A (CoA) have been demonstrated in our laboratory. The current work expands such CoA-centered pathway by generating new ribozymes that can catalyze the hydrolysis of thioesters of CoA.

#### 11:15 POST-TRANSCRIPTIONAL SILENCING OF *ARABIDOPSIS THALIANA* FERREDOXIN:SULFITE-REDUCTASE BY RNA INTERFERENCE

Scott Walper\*, Steven Adamson, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi, Hattiesburg, MS 39406

The product of the ferredoxin:sulfite reductase (SiR) gene is a bifunctional protein that functions as a DNA binding protein in chloroplast nucleoids and plays an integral part in the plant's sulfur assimilation pathway. In an attempt to better characterize the function of this protein in *Arabidopsis thaliana*, a binary vector was constructed that contains a portion of the gene sequence in both its sense and antisense orientation. An *Agrobacterium tumefaciens* bacterial host containing the plasmid construct can then be used to insert the desired sequence into the plant genome. When integrated into the plant genome, this construct silences the SiR gene without direct mutation of the gene itself. The sense/antisense combination forms a double-stranded RNA molecule due to the complementary nature of their sequences when transcribed. This structure stimulates a cellular response that cleaves the double-stranded RNA molecule into small fragments, which are then

free to bind to homologous RNA sequences, furthering the cleavage of double-stranded RNA molecules. As these fragments bind the SiR transcript, the mRNA is also cleaved into small non-functional segments. Those plants that successfully integrate the DNA sequence will be used in further studies to characterize the effects of a functional sulfite reductase knockout in planta.

#### 11:30 INCORPORATION AND INTRACELLULAR MAPPING OF HIS-TAGGED p43/EMAP II WITHIN THE MULTISYNTHETASE AMINOACYL-tRNA SYNTHETASE COMPLEX

Angela A. Reiken<sup>1</sup>\*, Cindy L. Wolfe<sup>2</sup>, and Mona T. Norcum<sup>1</sup>, <sup>1</sup>University of Mississippi Medical Center, Jackson, MS 39216, and <sup>2</sup>Tougaloo College, Tougaloo, MS 39174

Amino acids are covalently attached to their cognate tRNAs through the enzymatic action of aminoacyl-tRNA synthetases. In multicellular eukaryotes, nine of these enzymes form a distinct high molecular mass complex. Three auxiliary proteins (p43, p38, and p18) are also components of the multisynthetase complex. Previous studies have identified p43 as a precursor form of endothelial-monocyte activating protein II (EMAP II). This is an inflammatory cytokine involved in apoptosis. Primarily localized near the center of the multisynthetase complex, little to no p43 exists as a free polypeptide. In this study, human embryonal kidney cells were transfected with a plasmid expressing p43 tagged with his-6 and an additional epitope (V5). Immunoblot analysis showed that multisynthetase complex isolated from transfected cells contained his-tagged p43/EMAP II. This is the first demonstration that plasmid expressed tagged p43 can be incorporated into this particle. Immunofluorescence utilizing anti-p43 or anti-V5 antibodies showed that the complex is found in both the cytoplasm and nucleus of transfected cells. This is consistent with data from previous immunocytochemical studies. This work was supported by NSF grants MCB-0090539 and MCB-0215940.

#### 11:45 PURIFICATION AND INITIAL ELECTRON MICROSCOPY OF VALYL-tRNA SYNTHETASE-ELONGATION FACTOR 1H COMPLEX

Shoulei Jiang\*, J. Anthony Warrington, and Mona T. Norcum, University of Mississippi Medical Center, Jackson, MS 39216

In mammalian cells, valyl-tRNA synthetase (ValRS, 140 kDa) forms a stable *ca.* 700 kDa heterotypic complex with elongation factor EF-1H (ValRS-EF1H complex). EF1H is the "heavy form" of the translation elongation factor 1. It is a pentameric complex that contains four subunits  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\delta$  in molar ratio 2:1:1:1. This complex is unusual because it catalyzes sequential reactions in protein biosynthesis. Specifically, valyl-tRNA is synthesized, as well as transferred to the ribosome. The valRS-EF1H complex is highly susceptible to proteolysis and to date little structural information has been determined. We have successfully purified ValRS-EF1H



complex from K562 human erythroleukemia cells to near homogeneity. The isolation method uses polyethylene glycol fractionation, S and Q ion-exchange chromatography. Valyl-tRNA synthetase activity, SDS-PAGE silver staining gel patterns and immunoblot analysis verified the composition of the complex. Gel-filtration HPLC confirmed the 700 kDa mass. Initial negatively stained electron micrographs show a distinct particle. This indicates that the preparation is suitable for calculation of its three-dimensional structure. This work was supported by NSF grants MCB-0090539 and MCB-0215940.

## THURSDAY AFTERNOON

Caprice

### Section III The Protein World

#### 1:00 GELATIN AS A SUBSTRATE FOR PROTEASE DETECTION ON A QUARTZ CRYSTAL MICROBALANCE

James Daryl Pollard<sup>1</sup>, Clifton C. Watkins<sup>2</sup>, Newton C. Fawcett<sup>1</sup>, and Jeffrey Evans<sup>1\*</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Mississippi Valley State University, Ita Bena, MS

Quartz crystal microbalance (QCM) technology allows for the measurement of small mass changes on its surface by relating these mass changes to changes in frequency of an oscillating quartz crystal. The QCM is mass sensitive in the nanogram range with the frequency of the crystal decreasing as mass is attached. Consequently, the QCM is able to quantify the interactions between biomolecules such as proteases or enzymes that catalyze important physiological reactions. Proteases have important roles in industry, food processing, medical treatment, but ironically can be weaponized and used in biological and chemical warfare. Consequently, safe, accurate, and efficient protease assays are needed to determine the activity of various proteases. The QCM offers the possibility of protease activity detection by relating a mass change on its surface caused by protease cleavage to a commensurate frequency change. Two methods were performed in developing this assay. In this first method, gelatin immobilized by protein absorption to the crystal surface had a certain mass and frequency. The protease trypsin was introduced to the crystal surface and cleaved or released gelatin from the crystal surface and caused a frequency increase. In the second method, trypsin and gelatin were incubated together and then applied to the crystal surface. This produced a larger frequency decrease than a control gelatin with no trypsin. It was concluded that the QCM is able to detect protease cleavage using both methods.

#### 1:15 AGGREGATION OR SELF-ASSEMBLY OF THE CYT1A ENDOTOXIN FROM *BACILLUS THURINGIENSIS* VAR. *ISRAELENIS*

Slobodanka D. Manceva<sup>1\*</sup>, Marianne Pusztai-Carey<sup>2</sup>, and Peter

Butko<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Case Western Reserve University

The delta-endotoxin Cyt1A from *Bacillus thuringiensis* var. *israelensis* is used in commercial preparations of environmentally safe insecticides. Current hypothesis about its mode of action is that Cyt1A self-assembles into well-defined cation-selective channels in cell membranes, which result into a colloid-osmotic lysis of the cells. Recently a new hypothesis has been put forward suggesting that Cyt1A rather aggregates on the membrane surface and acts in a detergent-like manner. We used sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS PAGE) and time-resolved fluorescence of Tryptophan (Trp) to distinguish between Cyt1A's self-assembly (pore-forming model) and aggregation (detergent-like model). SDS PAGE revealed that in the presence of lipid Cyt1A forms a broad range of molecular-weight protein aggregates, some of which are so large that they do not enter the gel. If Cyt1A acts as a pore former then it should self-assemble into well-defined pores consisting of no more than six protein molecules. Trp fluorescence life-time measurements reveal that Cyt1A, in the absence of lipid, has a lifetime of 4.46 ns. Cyt1A binding to the lipid results in a 50% decrease in the quantum yield of Trp fluorescence, but the lifetime does not change, which indicates static quenching of Trp fluorescence, presumably due to the toxin aggregates in the membrane. Our data suggest that Cyt1A aggregates, rather than self-assembles, on the membrane surface.

#### 1:30 INTERACTION OF A CYCLIC AMPHIPATHIC PEPTIDE WITH LIPID MEMBRANES

Kelley Counts<sup>1\*</sup>, Oluyemisi Adeyemi<sup>1</sup>, Maria Ngu-Schwemlein<sup>2</sup>, and Peter Butko<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>University of Southern Alabama, Mobile, AL

Cyclic peptides serve a multitude of functions in cell biology, such as cellular adherents, inhibitors, regulators, and antibiotics. In this work we studied the interaction of a synthetic amphipathic cyclic octapeptide Octa-1 with model lipid membranes. The hypothesis of this study is that the positively-charged Octa-1 will interact with membranes and that this interaction will be more significant with the membranes containing negatively-charged lipids. The hypothesis was tested using small unilamellar vesicles (SUV) made of egg 1,2-diacyl-sn-glycero-3-phosphocholine (PC, a neutral lipid) and L-α-phosphatidylglycerol (PG, negatively-charged) in ratios of 10:0, 9:1, and 3:1. Octa-1 contains a single tryptophan residue, which was employed to determine the strength of the interaction and the location and orientation of the membrane-bound peptide by fluorescence spectroscopy. A calcein-release assay was used to test the lytic activity of the peptide. It was established that Octa-1 interacts with both the neutral and negatively-charged membranes, but the interaction is stronger with the charged SUV. The peptide is located deeper in the lipid bilayer when the membrane is negatively charged. The

lytic activity of the peptide is detected only at high concentrations (micromolar) and it correlates with the negative charge on the membrane.

#### 1:45 CHANGES IN EXPRESSION LEVELS OF FERREDOXIN:SULFITE REDUCTASE WITH CELL AGE IN A SOYBEAN SUSPENSION CULTURE

Jeffrey Broussard<sup>1\*</sup>, Steven Adamson<sup>2</sup>, Gordon C. Cannon<sup>2</sup>, and Sabine Heinhorst<sup>2</sup>, <sup>1</sup>Centenary College, Shreveport, LA 71134, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

Chloroplasts of plant cells do not contain a nucleus. Instead, the multiple copies of the organellar genome are compacted into complexes known as nucleoids by a set of proteins. Previous work in our lab had characterized an abundant nucleoid protein (DCP68) from plastids of cultured soybean cells that is able to compact DNA *in vitro*. This protein was later identified as ferredoxin:sulfite reductase (SiR), an enzyme of the sulfur assimilation pathway. In light of the bifunctionality of this protein, it is important to determine which regulatory strategies plants employ to modulate abundance and biological function of DCP68/SiR. It is well documented that the protein composition of plastid nucleoids changes during plant development and maturation, and that these nucleoid remodeling events are accompanied by changes in plastid transcription and DNA replication activity. Since DCP68/SiR inhibits DNA replication *in vitro*, it was of interest to determine whether the protein's abundance in cultured soybean cells undergoes changes as the cells age. Soluble protein extracts were prepared from cells harvested at different times post transfer into fresh medium. The proteins were separated by SDS-PAGE, electroblotted onto nitrocellulose and the abundance of DCP68/SiR probed with antiserum against recombinant SiR from *Arabidopsis thaliana*. Our results revealed a decrease in abundance of the 68 kDa DCP68/SiR polypeptide with increasing cell age, and a concomitant increase in the abundance of a 63 kDa band species that is likely to be a proteolytic processing product of the 68 kDa protein.

2:00 Break

#### 2:15 EFFECT OF SULFUR METABOLITES ON THE EXPRESSION OF THE PLASTID NUCLEOID PROTEIN FERREDOXIN:SULFITE REDUCTASE IN CULTURED SOYBEAN CELLS

Brittney Hemba\*, Steven Adamson, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi, Hattiesburg, MS 39406

Ferredoxin:sulfite reductase (SiR) in higher plants is a bifunctional protein serving as an abundant DNA-binding protein of plastid nucleoids and as a member of the sulfur assimilation pathway. Because of the protein's dual role in the organelle, the regulatory mechanisms that govern its expression

in the plant cell are of particular interest. The abundance of SiR in the plastid is likely to affect its association with the nucleoid and could have consequences for structure and function of the DNA/protein complex, since SiR was shown to compact DNA and inhibit DNA replication *in vitro*. As a step towards understanding the regulation of SiR expression, the role of the key sulfur metabolites O-acetyl-L-serine (OAS), L-cysteine, and glutathione in controlling SiR expression was examined. L-cysteine and glutathione down-regulate the expression of several sulfur assimilatory enzymes, likely through a feedback control mechanism, whereas the sulfur biosynthesis pathway activator, OAS, upregulates the expression of these enzymes.

#### 2:30 REGULATION OF FERREDOXIN:SULFITE REDUCTASE DURING DEVELOPMENT OF *ARABIDOPSIS THALIANA*

Steven Adamson\*, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406

Sulfite reductase (SiR) [EC 1.8.7.1] from higher plants catalyzes the six-electron reduction of sulfite to produce sulfide. Siroheme and an iron-sulfur cluster aid in catalysis, and in photosynthetic tissues, ferredoxin serves as the electron donor. Our research group recently discovered SiR is an abundant DNA-binding protein present in plastid nucleoids of higher plants. Our continued research is focusing upon the regulation of this bifunctional plastid protein. To further explore cellular strategies that coordinate which role SiR plays in response to internal and external developmental cues, the abundance of SiR protein its transcript levels in leaf and non-photosynthetic root tissues were determined. SiR protein levels were found to be low in young root tissue and to accumulate as the root matures. A relatively small difference in SiR levels, on the other hand, was observed between leaf tissue obtained from young and mature *Arabidopsis* plants. SiR is a phosphoprotein, and a strong increase in its DNA-binding affinity upon dephosphorylation *in vitro* had been observed previously. Since posttranslational modification of nucleoid proteins might be an *in vivo* regulatory strategy to modulate structure and function of the plastid protein/DNA complexes, the isoelectric point of SiR is currently being examined as a first step towards assessing potential changes in the phosphorylation state of SiR during development.

#### 2:45 THE CARBOXYSOME $\epsilon$ -CARBONIC ANHYDRASE: FACILITATING CO<sub>2</sub> FIXATION

Eric B. Williams\*, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406

Many autotrophic bacteria contain an energy-dependent carbon concentrating mechanism (ccm) that functions to increase the intracellular concentration of dissolved inorganic carbon (C<sub>i</sub>). One component of the ccm is the carboxysome, which functions to convert C<sub>i</sub> into reduced carbon metabolites. Carboxysomes are found in many autotrophic organisms and contain the CO<sub>2</sub> fixing enzyme *ribulose-1,5-bisphosphate*

carboxylase/oxygenase (RuBisCO) bounded by a 3–4 nm protein shell. It is thought that the sequestration of RuBisCO into carboxysomes enhances the catalytic efficiency of CO<sub>2</sub> fixation. Recently, the carboxysome shell (CsoS) protein CsoS3 was shown to have carbonic anhydrase (CA) activity. Carbonic anhydrase catalyzes the reversible dehydration of bicarbonate to CO<sub>2</sub>, which is the only substrate for the RuBisCO catalyzed carboxylation reaction. Because the majority of the C<sub>i</sub> in the cytosol exists as bicarbonate, a rapid conversion from bicarbonate on the exterior of the carboxysome to CO<sub>2</sub> in the interior is needed to saturate the RuBisCO catalytic site. It may be possible that CsoS3 facilitates CO<sub>2</sub> fixation by directionally converting bicarbonate to CO<sub>2</sub> towards the interior of the carboxysome and that carboxysomes are resistant to CO<sub>2</sub> loss by diffusion. To test these possibilities, different states of carboxysomes were analyzed by stopped flow spectroscopy and investigations of CsoS3 catalysis were performed to determine the favored direction of the enzymatic interconversion of bicarbonate and CO<sub>2</sub>.

### 3:00 OPTICAL DIFFERENCE SPECTROSCOPY TO MEASURE BINDING OF WARFARIN ENANTIOMERS TO CYTOCHROME P450 3A4

Juliette Sandifer\*, Gary Reid Bishop, and Stanley V. Smith, Tougaloo College, Tougaloo, MS 39174; Mississippi College, Clinton, MS 39058; and University of Mississippi Medical Center, Jackson, MS 39216

Cytochrome P450s are a superfamily of heme proteins found throughout the plant and animal kingdoms. Cytochrome P450s catalyze a number of reactions on a broad array of structurally distinct compounds. They are involved in many cellular processes but are particularly relevant to drug metabolism. Human cytochrome P450s 1A2, 2C9, 2C19, 2D6, and 3A4 are the major isoforms involved in drug metabolism and contribute to metabolism of the majority of the drugs used in clinical settings. Discovering the features at the molecular level governing substrate recognition and binding is the key to better understanding the structure/function relationships in the P450 superfamily. In this study we sought to characterize the binding of warfarin enantiomers to cytochrome P450 3A4. Warfarin is extensively metabolized to inactive metabolites by the cytochrome P450s. Using optical difference spectroscopy, we determined spectral binding constants (K<sub>s</sub>) for racemic (R/S), R-, and S-warfarin binding to cytochrome P450 3A4. The estimated K<sub>s</sub> values are in the μM range for the pure enantiomers and the R/S mixture. The K<sub>s</sub> for S-warfarin indicated that its binding affinity for P450 3A4 was 2–3 fold higher than that of R-warfarin. We have access to detailed structural information on R- and S-warfarin. The results obtained in this study are a prelude to more detailed studies aimed at measuring the effects warfarin enantiomers have on the conformational dynamics of cytochrome P450 3A4 and to eventually creating structural models for cytochrome P450 3A4 based on the experimental data.

### 3:15 Divisional Poster Session

#### IMPROVING TRANSFORMATION EFFICIENCY IN *HISTOPLASMA CAPSULATUM* BY MODULATING ELECTROPORATION TIME CONSTANTS OR PULSE SHAPES

Selena Young<sup>1\*</sup>, Glenmore Shearer, Jr.<sup>2</sup>, and Rebecca Phelps<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

*Histoplasma capsulatum* is the etiological agent of histoplasmosis, a common respiratory mycosis of humans. This dimorphic fungal pathogen grows at 25 °C in the soil as a differentiated multicellular mold and at 37 °C in the lungs of the host as an undifferentiated single-cell yeast. Its occurrence is worldwide and it affects approximately 500,000 people every year. The identification of the dimorphism genes can be important in the treatment of the disease. Electroporation is an important tool that was used to determine the genes responsible for dimorphism. Several different time constants were tested in order to determine the optimal transformation efficiency. Time constants of 8 ms to 20 ms were used. The results indicate that the highest time constant, 20 ms, yielded the best transformation efficiency. Because the efficiency was still increasing at 20 ms, it was not certain that the optimal time constant was found. More experiments at even higher time constants are necessary in order to determine optimal time constant efficiency.

#### AUTOMATED DNA EXTRACTION

Bianca Clark<sup>1\*</sup>, Stephanie Warren<sup>2</sup>, and Don Sittman<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Automated robotics liquid-handling systems can aid researchers in many high-throughput laboratory procedures. Through the use of additional, assorted labware these machines can perform DNA extraction, RNA extraction, PCR purification, automated gel loading, etc. Each of these procedures can be performed in a relatively short amount of time producing high quality results; to perform these procedures, programs or templates must be written for the instruments. Some programs are available from the companies that make the robots or that make nucleic acid purification kits. The objective of this study was to successfully carry out DNA extraction using a Multi-PROBE II automated liquid-handling system. To accomplish this, DNA extraction kits (some of which included templates) were obtained from Promega, Millipore, and Qiagen. Each of these kits provided the solutions needed to carry out DNA extraction, and the templates provided the parameters to carry out the necessary actions (vacuuming of plates, mixing of solutions, pipetting, etc.). As designed these kits provide high quality DNA. Templates were modified or created for each kit. In conclusion, only the Qiagen kit with an extensively modified template was compatible with the Multiprobe II.

#### CONSTRUCTION OF PLANT BACTERIAL ARTIFICIAL CHROMOSOME (BAC) LIBRARIES

Anna Nelson<sup>1\*</sup>, Breonica Carter<sup>1</sup>, and Daniel Peterson<sup>2</sup>,  
<sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>Mississippi State University, Mississippi State, MS 39762

The construction and characterization of a bacterial artificial chromosome (BAC) library for the plant species *Gossypium arboreum* was carried out through intensive chemical processes. A protocol was first developed to isolate high molecular weight nuclear DNA for the plant species. DNA analysis was performed to examine if the lengths of the DNA were sufficient. This was followed by an isolation and preparation of the BAC vector, which includes a restriction digest of the vector to produce cohesive termini (sticky ends) and dephosphorylation. A bacterial culture was plated and a Miniprep and NotI digest was run to isolate plasmids from the bacterial cultures. A pulse-field electrophoresis gel was run to test for "true-positive." Test restrictions digest; first and second size selections, isolation of size-selected DNA from agarose and a ligation, test transformation, and NotI digest were followed to obtain DNA between lengths of 100 kb to 350 kb. It also provides information on the success of the ligation and transformation using plant DNA as the source of inserts. After the acquired insert DNA was attained a mass transformation was done. This was by the spreading of agar on a plate and creating a colony of bacteria where each tray should contain between 2000–3000 colonies, and a vast majority of the clones should be white. When this was successfully done a robot, The Genetix Qbot, picked the white clones and placed them into freezing media in microtiter plates to create an ordered BAC library.

BINDING OF TRYPTOPHAN CONTAINING HISTONE H1<sup>o</sup>  
 Sonya Brown<sup>1\*</sup>, Yuguang Song<sup>2</sup>, and Susan Wellman<sup>2</sup>, <sup>1</sup>Mississippi College, Jackson, MS 39210, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

H1<sup>o</sup> proteins are linker histones involved in the packaging of eukaryotic chromatin. To investigate the binding of these histones to double-stranded DNA, we created a mutant histone, H1<sup>o</sup>-W, which exhibited fluorescence. (Wild type H1<sup>o</sup> proteins are not fluorescent.) The QuikChange<sup>TM</sup> Site-Directed Mutagenesis kit was used to replace the amino acid phenylalanine with the fluorescent amino acid tryptophan. Using an excitation wavelength of 280 nm and emission interval of 350–430 nm, we determined that significant fluorescence of the H1<sup>o</sup>-W protein was not detectable for concentrations of less than approximately 2  $\mu$ M. To investigate differences in binding site size on DNA and the binding affinity, we titrated both the H1<sup>o</sup> and H1<sup>o</sup>-W histones with varying concentrations of T4 Cyt DNA. Thermal denaturation curves were simulated. Analysis of this data suggests that the binding site size for the H1<sup>o</sup> protein is  $n = 8$ , where  $n$  is the number of base pairs bound by one histone, and that the affinity constant,  $K$ , is  $1 \times 10^8 \text{ M}^{-1}$ . The values for the affinity and binding site size (respectively  $K = 9 \times 10^7 \text{ M}^{-1}$  and  $n = 7$ ) for H1<sup>o</sup>-W are slightly smaller than those of H1<sup>o</sup>. However, data

obtained from the study of a previously constructed H1<sup>o</sup>-W mutant suggested that the affinity is  $7 \times 10^8 \text{ M}^{-1}$  and binding site size is 1<sup>o</sup>. Because of the variability of the H1<sup>o</sup>-W data, we are unsure of how much error is introduced into the data because of the experimental method.

SCREENING FOR CELL DEDIFFERENTIATION MUTANTS IN *ARABIDOPSIS*

June Sun\*, Wai-Foong Hong, and Zhaohua Peng, Mississippi State University, Mississippi State, MS 39762

Most plant cells are totipotent, meaning that the differentiated cells are capable of regenerating new plants. This remarkable regeneration ability has been shown to depend on the function of cell dedifferentiation. By definition, cell dedifferentiation is a reverse process in which the fully specialized cells return to their primitive cell forms-the stem cell. The dedifferentiated cells are capable of reassigning their functions and destinations. Recently, it has been shown that cell dedifferentiation is essential for tissue regeneration (wounding repair) and cloning, and tightly associated with carcinogenesis in mammals, including human beings. In order to understand the mechanisms of cell dedifferentiation, *Arabidopsis* was used as a model plant for isolation of the related genes. In our mutant screening system, different levels of chemical induction were tested. A range of mutants were isolated, monitored, and recorded. Currently, we are analyzing the cell dedifferentiation related genes that have been identified from the mutants. Spatial and temporal expressions of these genes are going to be conducted in the future experiments. This work is significant because it may contribute to asexual propagation in plants and tissue/organ regeneration and cancer prevention in medical sciences.

SUB-PROTEOME ANALYSIS OF CHROMATIN AND ITS ASSOCIATED PROTEINS IN *ARABIDOPSIS THALIANA*

Lifeng Zhang\*, Brahma Nanda Chitteti, and Zhaohua Peng, Mississippi State University, Mississippi State, MS 39762

Chromatin and its associated proteins play an essential role in cell differentiation and organ formation. Identification of proteins and their functions from different subcellular compartments is a branch of Proteomics. To identify protein expression profile of different tissues in *Arabidopsis thaliana*, we have developed a high efficient chromatin isolation method using differential centrifugation and sucrose gradients. The expression patterns of pure chromatin subproteome from different tissues have been showed on 2-D gels. Some proteins have been identified by MALDI-TOF and LC/MS/MS mass spectrometry analyses. Rest of chromatin and its associated proteins are going to be identified in the near future.

MEASURING SURFACE PRESSURE OF LIPIDS AT THE AIR/WATER INTERFACE

Shalawn Clark\* and Peter Butko, University of Southern Mississippi, Hattiesburg, MS 39406

Langmuir trough is an instrument that measures surface pressure monolayers of amphiphilic molecules at the air/water interface. The aim of our initial experiments was to test our setup with known lipid systems. We used monolayers of 1,2-diacyl-sn-glycero-3-phosphocholine isolated from egg (PC) and the synthetic 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC). At low surface pressures the lipid is in the two-dimensional gaseous state (G). Upon compression it will undergo a phase transition to the liquid-expanded state (L1). When the L1 state is subject to further compression a transition to the liquid-condensed state (L2) occurs. When the L2 state is further compressed the lipid will reach the solid state (S). Once the monolayer has reached the S state it cannot be further compressed and it changes into a three-dimensional structure, presumably a multilamellar form, which is marked by a rapid decrease in surface pressure. The isotherms constructed from our data demonstrate the existence of the known states and phase transitions. The present results represent control data for the future project, in which we will investigate protein-lipid interactions of cytolytic peptides and toxins.

#### PURIFICATION OF THE GLOBULAR DOMAIN OF HISTONE H1<sup>o</sup>

Kelly Woods<sup>1\*</sup>, Eric George<sup>2</sup>, and David T. Brown<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Nucleosomes, the fundamental unit of eukaryotic chromatin, are composed primarily of DNA and histones. Histones are the most abundant proteins associated with eukaryotic DNA. One class of histones, known as the H1 or linker histones, bind to DNA to stabilize two full turns of DNA around the nucleosome core. Histone H1 facilitates the folding and stabilization of the 30 nm chromatin fiber and is believed to function as a non-specific repressor of transcription. Histone H1 has a tripartite structure consisting of a central globular domain and extended highly basic amino- and carboxy-terminal tails. The central globular domain is believed to bind to the nucleosome near the DNA entry and exit points. A long term goal of our laboratories is to understand this interaction in greater detail. Towards this end we have cloned the gene for a histone H1 variant called H1<sup>o</sup> and constructed a number of mutants in which the amino acid coding capacity has been changed by in vitro mutagenesis. These mutants will be analyzed by a number of in vivo and in vitro techniques. The major goal of this study was to develop methods for the production of large amounts of these proteins and for purification of the proteins to a sufficient level for analysis by circular dichroism and X-ray crystallography. Circular dichroism will determine the amount of alpha helical content of a protein and allow a preliminary determination of whether the secondary structure of our mutants is disrupted. Ultimately, X-ray crystallography will allow the three-dimensional structure of these proteins to be determined.

#### REGIO-SPECIFIC ( $\omega$ TO $\omega$ -6) LAURIC ACID HYDROXYLATION IN HUMAN RECOMBINANT AND PEROXISOME PROLIFERATOR-TREATED JUVENILE CATFISH MICROSOMES

Mary L. Haasch\*, Annette W. Ford, and Jimmy C. Allgood, University of Mississippi, University, MS 38677

Most studies of lauric acid hydroxylation have focused on only two hydroxylation products,  $\omega$  and  $\omega$ -1. Modifications of an HPLC method (Lemaire et al., 1992) to include GC-MS (Buhler et al., 1997) have allowed more sub-terminal hydroxylation products including  $\omega$ -2 to  $\omega$ -6 to be quantified. Previously we have shown that in male rat liver microsomes,  $\omega$  to  $\omega$ -2 hydroxylation products of lauric acid, significantly increase in response to peroxisome proliferating agents (PPAs). Interestingly, adult catfish exposed by i.p. injection, to the PPAs, clofibrate (CLO) or the more potent ciprofibrate (CPR), did not exhibit any changes in hepatic microsomal lauric acid hydroxylase (LA-OHase) activities, although kidney microsomal  $\omega$  and  $\omega$ -6 products were increased significantly. In rainbow trout,  $\omega$ -1 lauric acid hydroxylation is catalyzed by CYP2K1 and  $\omega$ 6 by CYP2M1 (Buhler and Wang-Buhler, 1998). Induction of CYP2K1/2M1-like immunoreactive proteins in catfish by 48 hr i.p. injection of CLO and CPR has been shown (Haasch, 1996). Waterborne, 48 hr exposure of juvenile channel catfish (*Ictalurus punctatus*; size range 7.24 g to 34.32 g) to 1 ppm CLO (4.12 nM) or 2,4-dichlorophenoxyacetic acid (2,4-D; 4.52 nM) produced significant increases in both  $\omega$ -1 and  $\omega$ -5 hydroxylation products. Unexpectedly,  $\omega$ -1 activity was absent in juvenile control and vehicle (DMSO) treated fish although we have previously shown that adults have relatively high  $\omega$ -1 activity (Haasch, 1998). Regio-specific lauric acid hydroxylation was also investigated in human recombinant microsomes for isozyme control, CYP4A11 and CYP2E1. There is potential for sub-terminal hydroxylation products to act as second messengers in cellular signal transduction or to interfere with steroid biotransformation. These hypotheses will be investigated in future research. (Work supported by ES07929)

#### CHARACTERIZATION OF THE INTERACTION BETWEEN PROTEINS B23 AND NPM3

Nian Huang\* and Mark Olson, University of Mississippi Medical Center, Jackson, MS 39216

B23/NPM is a predominant nucleolar protein, which has multiple activities, including nucleic acids binding, ribonuclease, interacting with the HIV-1 Rev protein and working as a molecular chaperone. In an effort to find the interacting partners of protein B23 a yeast two hybrid screen was performed. Several potential interacting partners were identified, including two ribosomal proteins. Multiple positive clones were found to contain a cDNA for protein NPM3, which belongs to the nucleoplasmin family of which protein B23 is also a member. B23 and some of its deletion mutants were able to be co-immunoprecipitated by FLAG tagged NPM3 *in vivo*. Using indirect immuno-fluorescence microscopy B23 and

NPM3 co-localized in the nucleolus and both of their locations were dependent on pre-rRNA transcription. These two proteins were analyzed in whole cell extracts subjected to sucrose gradient ultracentrifugation. Unlike B23, of which most sedimented at 10S, NPM3 sedimented both near the top of the gradient and at 90S. This suggests although both of the proteins are involved with ribosome assembly, they may have different roles that depend on the components with which they associate.

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## FRIDAY MORNING

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Gulf Hall

Concurrent Session

8:30 Mississippi Functional Genomics Network (MFGN) Session

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## FRIDAY MORNING

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Caprice

Concurrent Session

9:00 Divisional Poster Session

### CELLULAR MECHANISMS REGULATING NOREPINEPHRINE TRANSPORTER ACTIVITY

P.G. Mandela\* and G.A. Ordway, University of Mississippi Medical Center, Jackson, MS 39216

Neurotransmission at noradrenergic terminals is terminated by reuptake of norepinephrine (NE) back into cytoplasm via the norepinephrine transporter (NET). Given its pivotal role in neurotransmission, regulation of NET function has important implications for brain function in health and disease. This study examined the potential involvement of NE synthesis, storage and release in regulating NET function. Alpha-methyltyrosine (AMT) is a tyrosine hydroxylase inhibitor that abolishes NE synthesis. Treatment of NET-expressing cells (SK-N-SH and PC12 cells) with 5 to 100  $\mu$ M AMT did not affect NET function. Reserpine blocks vesicular storage of NE by blocking the vesicular monoamine transporter (VMAT) that is located on secretory vesicles. Brief exposure

to reserpine reduced reuptake of NE by the NET in both PC12 and SK-N-SH cells. In PC12 cells, reserpine decreased uptake via the NET at concentrations as low as 10 nM, while reserpine's actions on NET activity were seen only at concentrations 5  $\mu$ M and above in SK-N-SH cells. In SK-N-SH cells, reserpine's effect on NE uptake at the NET was rapid, reaching a plateau within 5 min. Reserpine's effect on NE uptake was independent of protein kinase C and CAM kinase II mechanisms. Reserpine did not decrease the affinity ( $K_m$ ) of the NET for NE, but decreased the maximum velocity of the transporter ( $V_{max}$ ). Support Contributed By: MH 58211 and MH/AG 02031

### GCR2, A TRANSCRIPTIONAL ACTIVATOR OF GLYCOLYTIC GENES, ALSO MEDIATES CELL CYCLE PROGRESSION

Je'Tua Eadon<sup>1\*</sup>, Balaraj Menon<sup>2</sup>, and George M. Santangelo<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

*Saccharomyces cerevisiae* is a model organism of choice for studying various metabolic and cellular processes. GCR2, along with GCR1 and RAP1, is involved in the transcriptional activation of glycolytic genes. CLN1, CLN2 and CLN3 represent a family of cyclins, which are needed for transition from the G<sub>1</sub> to S phase of the cell cycle. We constructed different GCR2 and CLN deletion mutants (*gcr2Δ*, *gcr2Δ cln1Δ cln2Δ*, and *gcr2Δ cln3Δ*) and tested for their growth phenotypes at the permissive (23 °C) and restrictive temperatures (16 °C and 37 °C). The *gcr2Δ cln1Δ cln2Δ* and *gcr2Δ cln3Δ* mutants were found to be both temperature and cold sensitive. Moreover, the *gcr2Δ cln1Δ cln2Δ* and *gcr2Δ cln3Δ* mutants showed a different arrest phenotype after shifting to 37 °C in liquid medium. The *gcr2Δ cln1Δ cln2Δ* mutants arrested as elongated or filamentous cells, while the *gcr2Δ cln3Δ* mutants arrested predominantly as unbudded cells, indicative of a G<sub>1</sub> phase arrest. The *gcr2Δ* mutant by itself showed no change in phenotype or temperature sensitivity. Although further experiments need to be performed to elucidate the exact role of GCR2 in growth and cell cycle progression, preliminary studies suggest that a defect in glycolysis may seem to misregulate cell cycle progression.

**MFGN Session at the MAS  
February 20, 2004  
8:30 a.m.-11:30 a.m.**

- I. Welcome and Introduction**
- II. Overview of MFGN Program**
- III. MFGN Research Core Facilities**
- IV. Awards**
  - Past**
  - REO applications summer 2004**
- V. MFGN Faculty Research Presentations**
  - 2003 SIdER Recipients -Marta Piva and Stanley Smith**
  - 2003 SGOs Recipients - Reid Bishop and Sarah Lea McGuire**
- BREAK 10 minutes**
- V. MFGN Students Sonya Brown (Wellman)), Kimberly Cornelius (Duhe), Juliette Sandifer (Smith)**
- VI. Bioinformatics examples, teaching, research**
- VII. Adjourn to Bioinformatics Tutorial and REO poster session**

# A THERMALLY TARGETED POLYPEPTIDE INHIBITOR OF C-MYC TRANSCRIPTIONAL ACTIVATION

Adrienne Rembert<sup>1\*</sup>, Gene L. Bidwell III<sup>2</sup>, Melissa A. Skertich<sup>2</sup>, and Drazen Racher<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

C-Myc is an oncogene that causes cells to divide at an uncontrollable rate when it interacts with Max. This c-Myc-Max interaction activates target genes that allow the cell to continue to divide. The current initial study explores the effect of cisplatin, an antimetabolic drug, and PenELP (Penetratin elastin-like polypeptide) on T24 cell growth at different temperatures. ELP is a polymer that can be thermally targeted to tumor cells and penetratin is a substance that mediates uptake of the ELP by cells. In a human system, PenELP binds the cisplatin and carries the drug to the laser-heated rapidly growing cells. PenELP aggregates in the tumor cells to deliver an increased concentration of the drug. T24 cells, a bladder cancer cell line, were treated with cisplatin alone, PenELP alone and combined cisplatin/PenELP. The cells were then heated to different temperatures and changes in cell growth were recorded. The results indicate that 4-day cisplatin treatment was more effective at killing tumor cells than 4-day PenELP treatment. The 4-day cisplatin treatment followed by a 2-day PenELP treatment was most effective with more cells being killed at 42 °C. Further studies will be done to find the optimal temperature for thermal targeting of the cisplatin/PenELP combination treatment.

# STRATEGIES FOR FUNCTIONAL GENOMICS IN *SYNECHOCOCCUS ELONGATUS* PCC 7942

Kimberly Baker<sup>1\*</sup>, Carolyn Holtman<sup>2</sup>, and Susan S. Goldman<sup>1</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>Texas A&M University, College Station, TX

The simplicity of cyanobacteria allows for its functionality. They are the simplest organisms known to have circadian rhythm functions. Circadian rhythms are daily cycles responsible for gene expression in response to changes in the day/night cycle. The objective of this project is to mutagenize and identify every gene that has an altered circadian rhythm function. The focus of this paper is on the strategies used to undergo the subcloning and mutagenesis of genomic DNA and introduction of mutants into the host strain of cyanobacteria, *Synechococcus elongatus* PCC 7942. The strategies include subcloning genomic DNA from cosmids to plasmids, mutagenesis of that DNA and placing mutant DNA in the *S. elongatus* genome. As a result of these processes a broader and more analytical perspective of molecular biological processes and gene manipulation has been obtained.

# FLUORESCENT RECOVERY AFTER PHOTOBLEACHING (FRAP) STUDIES OF NUCLEOLAR PHOSPHOPROTEIN B23 AND ITS MUTANTS IN HeLa CELLS

Sandeep S. Negi<sup>\*</sup> and Mark Olson, University of Mississippi

Medical Center, Jackson, MS 39216

B23 is an abundant multifunctional nucleolar phosphoprotein involved in ribosome biogenesis. Different activities associated with protein B23 include nucleic acid binding, ribonuclease and molecular chaperone activity. It is phosphorylated during interphase by protein kinase casein kinase 2 (CK2) and by cyclin dependant kinase 1 (cdk1) during mitosis. Previous studies have shown that many nucleolar components involved in ribosome biogenesis exchange rapidly between nucleolus and nucleoplasm. We studied the effect of CK2 phosphorylation on the dynamics of B23 in the nucleolus. We made a green fluorescent protein (GFP) tagged mutant of the wild type protein by changing the ser (125) to ala (125) by overlap extension. This mutant cannot be phosphorylated by CK2 and localize to the nucleolus as confirmed by fluorescent microscopy. Fluorescent recovery after photo bleaching (FRAP) studies show that the wild type protein and the mutant have different dynamics in the living cell. The recovery of this mutant is slower than the wild type. This implies that the mutant exchange more slowly with nucleoplasmic pool of free GFP tagged mutant protein than the wild type protein. Further studies on phosphorylation mimicking mutants (by changing ser to glu) are being conducted. These studies will give us an insight into the role of phosphorylation in regulation of B23 dynamics in the nucleolus.

# ENVIRONMENTAL INDUCTION OF CYP2M1-LIKE PROTEINS IN TWO TROPICAL FISH SPECIES BY PRODUCED FORMATION WATER ON THE NORTHWEST SHELF OF AUSTRALIA

Shiqian Zhu<sup>1\*</sup>, Susan Codi<sup>2</sup>, and Mary L. Haasch<sup>1</sup>, <sup>1</sup>University of Mississippi, University, MS 38677, and <sup>2</sup>Australian Institute of Marine Science, Townsville, Qld, Australia

There is a paucity of information available regarding hydrocarbon exposure of tropical fish species inhabiting the waters near oil and gas platforms on the Northwest Shelf of Australia. In 1998, a pilot study was funded by Apache Energy Pty Ltd to evaluate the use of sub-lethal stress indicators in fish to assess exposure to produced formation water (PFW). Tropical fish, the Gold-Spotted Trevally (*Carangoides fulvoguttatus*) and the Bar Cheeked Coral Trout (*Plectropomus maculatus*), were obtained from two sites impacted by PFW discharge, Harriet A (near field) and Harriet C (far field) and a non-impacted reference site, the Montebello Islands. The purpose of this study was to examine the expression of the cytochrome P450 isozyme, CYP2M1. Microsomal fractions from Trevally had two immunodetectable CYP2M1-like proteins, while Coral Trout had only one immunodetectable CYP2M1-like protein. The significant increases of CYP2M1-like proteins in Trevally were observed at both PFW impacted sites compared to the reference site. These results indicate that different tropical fish species may have different expression patterns of immunodetectable CYP2M1-like proteins, and that PFW contamination near the oil well platforms may possibly



induce CYP2M1-like proteins; male fish might be more sensitive than female fish. A previous study had shown increases in CYP2K1-like proteins. Increases in CYP2M1-like proteins in fish have not previously been described as a consequence of environmental petroleum hydrocarbon exposure.

#### ADH3 PROTEIN EXPRESSION AND DEVELOPMENTAL EFFECTS OF ETHANOL TOXICITY IN ZEBRA FISH (*DANIO RERIO*)

Erika Brown<sup>1\*</sup>, Keri Van Derel<sup>2</sup>, and Michael J. Carvan III<sup>2</sup>,  
<sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>Great Lakes WATER Institute, Milwaukee, WI 53204

Fetal Alcohol Syndrome (FAS) is a pattern of birth defects, such as physical and mental retardation, craniofacial malformations and joint abnormalities that occur during the development as a result of alcohol consumption during pregnancy. Zebra fish are used as a model system because they are easily bred and when exposed to ethanol they suffer from the same physical deformities and anomalies as humans do. In zebrafish, alcohol dehydrogenase (ADH3) is presumably responsible for metabolizing alcohol. In a study conducted by Dasmahapatra et al (2001), the EK and AB strains of the zebra fish were found to be more resistant to the ethanol when compared to the more sensitive TU strain. Using the AB and TU strains, it was found that the TU strain has higher levels of ADH3A mRNA than the AB strain, but it was expected to see more ADH3A mRNA in the AB strain since it is resistant to ethanol. The purpose of the present study was to investigate whether there would be a correlation between increased ADH3A mRNA and ADH3A protein levels. The cell lysate of the cloned ADH3A protein was used to check the antibody and showed that the antibody was recognizing the protein. The results from the western blots were not optimal. From this study, we concluded that in future experiments the assays would have to be repeated with serial dilutions of the antibody and protein to optimize the conditions. The experiment should be repeated with the various treatment groups. This research was sponsored by NIMH-COR grant MH16926.

#### THE EFFECT OF COENZYME Q10 ON COGNITION IN AGING MICE

Harriet Crockett<sup>1\*</sup>, Michael Forster<sup>2</sup>, Scott Coleman<sup>2</sup>, Nathalie Sumien<sup>2</sup>, and Margaret Rutledge<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096, and <sup>2</sup>University of North Texas Health Science Center, Fort Worth, TX

Oxidative stress involves increase in free-radical formation and a decrease in the levels of antioxidants in the mitochondria of the cell. Coenzyme Q10 is an antioxidant that prevents oxygen free-radical formation in the cell. The memory of coenzyme Q10 supplemented C57BL/6 mice were tested. The goal of this project was to determine if a dietary supplement of coenzyme Q10 could lessen the rate of oxidative stress occurring in the cell and improve impaired memory perfor-

mance. Twenty-one-month-old mice were placed on a diet supplemented with coenzyme Q10 for 12 weeks. Four-month-old (young) and twenty-one-month-old mice (old) were used as non-supplemented controls. Assessments of memory were made using retention of habituation in the old and young mice in a LMA. The mice were given two LMA tests and horizontal activity was measured. The first LMA test was done 6 weeks after the diet began, and the second test was done after 12 weeks on the diet. Each test was done in four sessions that were 4-minutes in length. Trend suggested that young controls showed better retention than old controls. However, in this experiment, statistical analyses showed no effect, which probably accounted for the unequal number of young controls as compared to the number of old controls. Evidence obtained from mice that were supplemented with low concentrations of coenzyme Q10, suggested that the dietary supplement did improve retention of habituation. Mice given high concentrations of coenzyme Q10 showed either no effect or a detrimental effect to the memory of the mice.

#### POPULATION STRUCTURE OF *TRIBOLIUM CASTANEUM*

Robert Walker<sup>1\*</sup>, Mike Wade<sup>2</sup>, and Jeffery Demuth<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096, and <sup>2</sup>Indiana University, Bloomington, IN 47401

The purpose of this research study is to determine whether or not there is a correlation between genetic and geographical distance. The number of genetic differences that distinguish two populations is their "genetic distance." When the populations do not exchange genes, genetic distance between two populations tends to increase because of the combined forces of mutation, random genetic shifts, and natural selection. To investigate whether genetic and geographic distance are correlated in the flour beetle, we used a technique referred to as Amplified Fragment Length Polymorphism (AFLP). AFLP fingerprints can be used to distinguish even very closely related organisms, including near isogenic lines. Most importantly, AFLPs have been shown to be reproducible and reliable. Numerous individuals from ten populations were fingerprinted using multiple primer pairs. After analyzing results from a single primer pair, these results suggest that there is no direct correlation between genetic distance and geographic distance.

#### ENHANCED LEVELS OF ANTIOXIDANT ENZYMES AND LIPID PEROXIDATION PRODUCTS IN LIVER AND KIDNEY OF RATS EXPOSED TO LEAD

Levenia Baker<sup>1\*</sup>, Yallapragada Prabhakara Rao<sup>2</sup>, Bettiaja Rajanna<sup>1</sup>, Christopher D. Bennett<sup>1</sup>, Jon J. Brice<sup>1</sup>, Samuel L. White<sup>1</sup>, and Kiran Kumar<sup>2</sup>, <sup>1</sup>Alcorn State University Alcorn State, MS 39096, and <sup>2</sup>Andhra University, Visakhapatnam, India

Lead is an environmental pollutant that affects several enzyme systems in liver and kidney. Liver and kidney are vital organs of the body, they show important detoxifying mecha-

nisms to metal toxicity. In general, both tissues are provided with quantities of antioxidant enzymes namely catalase, superoxide dismutase and glutathione-S-transferase compared to other organs. The objective of the current study is to determine the effect of lead on antioxidant enzymes as well as lipid peroxidation products in liver and kidney. Lead acetate (500 ppm) was administered to rats (Wistar strain, male) through drinking water. Controls were given a similar dose of sodium acetate in water. The animals were sacrificed at intervals of 1, 4, and 8 weeks by cervical dislocation, liver and kidney tissues were isolated. The tissues were washed with ice cold normal saline and processed for the estimation of the antioxidant enzymes named above and lipid peroxidation products. The results indicated a gradual and significant increase in all the antioxidant enzymes ( $P < 0.05$ ) and lipid peroxidation products in both tissues as compared to their respective controls and this increase was found to be time-dependent. The data also indicated that these effects were more in liver than kidney. The results suggest that lead exerts oxidative stress on both the tissues but liver had a higher response rate of lead induced formation of reactive oxygen species than kidney. (Supported by NIH/FIC/MIRT #T37 TW00132 and NIH/NIGMS/MARC GM #08739)

#### INHIBITORY EFFECT OF LEAD ON IKK-ALPHA-NF-KAPPA B-NNOS IN RAT BRAIN

Chun-juan Shan\*, Shang-Zhi Xu, and Bettaiya Rajanna, Alcorn State University, Alcorn State, MS 39096

Nitric oxide (NO) retrograde plays an important role in regulating synaptic vesicle endocytosis and recycling. Neuronal nitric oxide synthase (nNOS) is mainly responsible for its production in the brain. Transcription factor NF-kappa B is involved in nNOS regulation and it is activated by Ikb kinase a (IKK-alpha) in response to stimulation. Although it is reported that nNOS was inhibited by lead exposure, our hypothesis is whether NF-kappa B and IKK-alpha are affected by lead exposure in development rat brain as well? SD rats were used to test our hypothesis. As female rats have gestated, rats started to drink 0.1% lead acetate until day 21. The pups were weaned and back to drink distilled water (DDW). Brain stem (BS), cerebellum (CB), hippocampus (HC), and frontal cortex (FC) of rat brain on postnatal day (PND) 1, 5, 7, 10, 51, 30, and 45 were collected. Our results demonstrated that on PND1 not only nNOS but also NF-kappa B and IKK-alpha were decreased by lead in the above regions particularly in HC and FC; Inhibition had been strengthened on PND 5 and continue until PND 10. However, on PND 45 nNOS, NF-kappa B and IKK-alpha were recovered in all the parts of rat brain. It was suggested that nNOS, NF-kappa B and IKK-alpha were inhibited by lead treatment in earlier phase, but restored after the influence of lead was declined.

#### PKC ACTIVITY AND PROTEIN EXPRESSION WERE BOTH INHIBITED BY LEAD EXPOSURE IN THE BRAIN

#### OF RATS

Latoya Bullock\*, Kimberly Cornelius, Shang-Zhi Xu, and Bettaiya Rajanna, Alcorn State University, Alcorn State, MS 39096

There are at least 11 distinct isoforms of Protein kinase C (PKC). The differences among the PKC isoforms are attributed to the calcium or diacylglycerol-dependence activation of each. Most PKC isoforms are involved in the regulation of neurotransmitters, neuron growth, and anti-apoptosis. In the present study, when female rats were gestated, rats started to drink 0.1% lead acetate until 21<sup>st</sup> day of pups. The pups were weaned. Then they started back drinking distilled water (DDW). The brain stem (BS), cerebellum (CB), hippocampus (HC), and frontal cortex (FC) of the rat brain on postnatal day (PND) 1, 5, 7, 10, 15, 30, and 45 were collected. The PKC activities of total, calcium-independent, and calcium-dependent were determined by transferring  $\gamma$ -P<sup>32</sup>-ATP to histone. Immunoprecipitation and western blotting were used to assay protein expressions of PKC isoforms. Our results indicated that on PND 1, 5, and 10 total PKC activity was significantly inhibited by lead; most of them were calcium-dependent. On PND 1, PKC- $\gamma$  both in cytosolic and membrane fraction were decreased in HC and FC by lead, but other PKC isoforms did not occur; On PND 10, all of the above PKC isoforms were inhibited in the BS, CB, HC, and FC membrane fraction by lead in comparison with control group. On PND 45, the above PKC isoforms in lead treated group were restored except  $\epsilon$ . It suggests that not only is PKC activity dramatically inhibited by lead exposure in the developing brain of rats but protein expression is also.

#### A QUICK AND RAPID TEST FOR POLYAMINES IN URINE

Jana Causey\*, Amber Mcilwain, and Robert C. Bateman, Jr., University of Southern Mississippi, Hattiesburg, MS 39406

This project is aimed at finding better methods for determining the effectiveness of cancer treatments. In patients with successful curative surgical treatment, all preoperatively elevated urinary polyamine concentrations markedly decreased and returned to normal, whereas they were elevated and increased further in patients with proven relapse of the tumor and/or metastasis in different organs. We have developed rapid dipstick tests that will detect the presence of polyamines in urine. The stick will turn different shades of purple that can be matched to a standard shade to determine the concentration of polyamines present in the sample. Unfortunately, putrescine is often acetylated and interferes with the validity of the dipsticks. We have obtained a plasmid that contains the deacetylase. We present here the expression of the bacterial deacetylase and incorporation into the urine diamine assay.

# INCREASED TOXICITY OF HALOGENATED HYDROCARBONS WITH THE DEGREE OF HALOGENATION: A CYTOGENETIC STUDY IN MICE BONE MARROW CELLS

Babu P. Patlolla<sup>1\*</sup>, Anita K. Patlolla<sup>2</sup>, and B.S. Sekhon<sup>2</sup>,  
<sup>1</sup>Alcorn State University, Alcorn State, MS 39096, and <sup>2</sup>Jackson State University, Jackson, MS 39217

Halogenated aliphatic hydrocarbons have long been regarded as a pharmacological and toxicological entity. They are widely used in industry as solvents, degreasing agents, plastisizers and chemical intermediates in the manufacturing of other chemicals. Major halogenated compounds are the chlorinated hydrocarbons. In this study three chlorinated hydrocarbons were tested for their cytogenetic effects in mice bone marrow cells. Five different concentrations of 1,1-dichloroethane (500, 400, 300, 200, and 100 mg/Kg body weight), 1,1,1-trichloroethane (200, 150, 100, 50, and 10 mg/Kg body weight), and 1,1,2,2-tetrachloroethane (50, 40, 30, 20, and 10 mg/Kg body weight) were used to see the effect on chromosomal aberrations, mitotic index and micronuclei. Results indicated that the toxicity was highest in 1,1,2,2-tetrachloroethane and lowest in 1,1-dichloroethane. The increased effect could be due to the increasing degree of halogenation.

## Section IV Cellular Models

### 9:30 THE RAP1/GCR1/GCR2 TRANSCRIPTIONAL ACTIVATION COMPLEX ASSOCIATES WITH THE NUCLEAR ENVELOPE

Balaraj Menon<sup>1\*</sup>, Kristine A. Willis<sup>2</sup>, Satish Pasula<sup>1</sup>, Nayan Sarma<sup>1</sup>, Kellie E. Barbara<sup>1</sup>, Rebecca Phelps<sup>1</sup>, Brenda Andrews<sup>2</sup>, and George M. Santangelo<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>University of Toronto, Toronto, ON M5S1A8

The budding yeast *Saccharomyces cerevisiae* is an excellent model organism with which to study various eukaryotic cellular processes. The transcriptional activator Gcr1 in *S. cerevisiae* enhances expression of ribosomal protein genes, glycolytic genes, and all three G1 cyclin genes (CLN1, CLN2, and CLN3). Deletion of GCR1 causes delayed passage through Start in the cell cycle due to loss of the response to glucose. Mass spectrometry of partially purified Gcr1 detected co-purification of both Kap123 (a karyopherin that associates with nuclear pores and is involved in protein import/export) and the replication factor Mcm2; we have also successfully immunoprecipitated complexes that contain both Gcr1 and Kap123. Since Gcr1 (785 residues total) contains transmembrane domains (residues 64–92 and 191–219) and localizes to the yeast nucleus, we investigated the possibility that it functions at the nuclear periphery. We found that Gcr1 was indeed present in purified yeast nuclear envelope fractions. Further, co-localization and Fluorescence Recovery after Photobleaching (FRAP) studies suggest that Gcr1 and associated factors (Rap1 and Gcr2) are components of the same relatively immobile

nuclear structure.

### 9:45 THE USE OF AG490, A PROTEIN TYROSINE KINASE INHIBITOR, TO GENERATE NON-TYROSINE-PHOSPHORYLATED RAT JANUS KINASE 2 MUTANTS IN Sf21 INSECT CELLS

Kimberly Cornelius<sup>1\*</sup>, Kiranam Chatti<sup>2</sup>, and Roy J. Duhé<sup>2</sup>,  
<sup>1</sup>Alcorn State University, Alcorn State, MS 39096, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Janus kinases (JAKs) are intracellular protein tyrosine kinases, which regulate proliferation, differentiation and apoptosis through their role in cytokine and endocrine hormone signal transduction. Phosphorylation of tyrosines within the activation loop of JAK2 alters the efficiency of catalysis with respect to ATP. We intend to develop JAK2-targeted anti-cancer drugs by exploiting the differential catalytic properties of phosphorylated vs. non-phosphorylated JAK2. When rat JAK2 mutants are overexpressed in Sf21 insect cells, they are purified as a heterogeneous mixture of tyrosine-phosphorylated and non-phosphorylated enzymes. Our objective was to maximize production of non-phosphorylated JAK2 proteins by treating infected Sf21 cells with AG490 during the production of these proteins. Recombinant baculoviruses expressing glutathione-S-transferase-tagged forms of rat JAK2 were used to infect Sf21 insect cells, which were then treated with AG490. Cells were harvested after 48 hours, aliquots of cell lysates were boiled with sample buffer and resolved by SDS-PAGE, transferred to PVDF membrane, probed with polyclonal anti-JAK2 and monoclonal anti-phosphotyrosine antisera. Our results showed that phosphorylated JAK2 was in each sample except for 200  $\mu$ M AG490 samples. We concluded that treating Sf21 cells with low concentrations of AG490 did not significantly alter phosphorylation status of JAK2, and treatment of Sf21 cells with concentrations of 100  $\mu$ M or greater impaired production of JAK2.

### 10:00 THIOREDOXIN-MEDIATED ENHANCEMENT OF JANUS KINASE ACTIVITY

Naila Mamoon\*, Sheeyong Lee, and Roy J. Duhé, University of Mississippi Medical Center, Jackson, MS 39216

Thioredoxin (Trx), a dithiol oxidoreductase has been reported to promote cell growth by enhancing the mitogenic effect of cytokines. Overexpression of Trx occurs in certain leukemias wherein cells proliferate without cytokine stimulus, a phenomenon attributed to constitutive JAK3 activation. The catalytic activities of JAK2 and JAK3 are modulated by their redox states; enzymatic activity is abolished by oxidation and restored upon reduction by dithiol reducing agents. We hypothesize that the observed constitutive activation of JAK3 occurs due to high intracellular levels of Trx, a biological reductant, which maintains JAK3 in its maximally active state, leading to unabated proliferation of T-cells in the absence of mitogenic stimulation by IL-2. Using recombinant Trx and GST-rJAK2 in an in vitro assay we demonstrate that Trx

restores autokinase activity of oxidatively-inhibited JAK2 while a redox-inactive mutant form of Trx does not. Experiments are underway to demonstrate a similar effect of Trx on endogenous JAK2 and JAK3 and to identify the cysteines that confer redox sensitivity to these enzymes. Using IL-2/JAK3 and IL-3/JAK2 signal transduction models, we are currently investigating the effects of high levels of Trx on cellular proliferation. Preliminary data show that exogenously added Trx enhances the mitogenic effect of cytokines. Pretreatment with purified Trx countered the growth-inhibitory effect of DNCB, a thioredoxin reductase inhibitor. The overall goal of this project is to validate a novel target for redox-based chemotherapy.

#### 10:15 AN IN VITRO APPROACH TO CHARACTERIZE STATE-SELECTIVE JANUS KINASE 2 INHIBITORS

Kanakadurga Kundrapu\*, Kiranam Chatti, and Roy J. Duhé, University of Mississippi Medical Center, Jackson, MS 39216

Janus kinases are cytoplasmic protein tyrosine kinases with crucial physiological roles. The binding of various class II cytokines to their receptors initiates JAK activation, which in turn causes proliferation or differentiation in cells of various lineage. Uncontrolled JAK2 activity may contribute to the progression of certain cancers. Considerable interest exists in developing JAK-targeted inhibitors. We are currently using an in vitro approach to identify and characterize selective inhibitors of rat JAK2 activity. Several approaches to develop a quantitative biochemical assay for rJAK2 activity have been under way in our laboratory. One of our novel findings has been that rJAK2 exists in at least two distinct states of activity. The phosphorylation of tyrosines within the activation loop of rJAK2 appears to increase its autocatalytic efficiency with respect to ATP, with highest activity when its activation loop is phosphorylated and lower activity when the activation loop is unphosphorylated. We are determining whether this implied difference in ATP binding affinities between the two states of rJAK2 also extends to a difference in affinities for the acceptor substrates, such as the STATs. Based on our demonstration of the differential behavior of these two states towards ATP, we propose that a JAK2 inhibitor(s) could selectively distinguish between these two activity states. State-selective inhibitors of JAK tyrosine kinase activity would represent a novel class of potential therapeutic agents.

10:30 Break

#### 10:45 IDENTIFICATION OF CYSTEINE RESIDUES RESPONSIBLE FOR REDOX SENSITIVITY OF JANUS KINASE 2 VIA SITE-DIRECTED MUTAGENESIS

Jay Craddock<sup>1\*</sup>, Kiranam Chatti<sup>2</sup>, and Roy J. Duhé<sup>2</sup>, <sup>1</sup>Millsaps College, Jackson, MS 39210, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Janus protein tyrosine kinases are crucial transducers of signals originating when cytokines bind to their receptors. We have shown that the activity of JAK2 is sensitive to the redox status of the enzyme. It is fully active when reduced mildly and completely catalytically inactive with mild oxidation. This reversible redox sensitivity suggests the interconversion of disulfide/dithiol bonds between cysteine residues within (or near) the catalytic site of JAK2. There are nine cysteine residues within the C-terminal domains of rat JAK2 that may participate in the dithiol-disulfide exchange and thus contribute to the redox sensitivity. Using a recombinant form of JAK2 subcloned into a baculoviral transfer vector (pAcGHLT-A:(Ndelta661)rJAK2), we are creating a progressive series of site-directed mutant enzymes, with each successive mutant harboring an additional substitution of serine for each of the nine cysteine residues. Each mutation is being verified by DNA sequencing. The mutant transfer vectors will be used to create recombinant baculoviruses to produce JAK2 variants in infected insect cells. Preliminary work using nine single cysteine-to-serine mutants showed no significant loss of redox sensitivity in any single mutant. Our hypothesis is that the enzyme will lose redox sensitivity after all critical cysteines are converted to serines. The identification of the critical cysteine(s) may provide a useful structural determinant for the design of novel JAK2-targeted drug candidates.

#### 11:00 THE LOCALIZATION OF HOST AND VIRAL DNA DEPENDENT RNA POLYMERASE II IN IRIDOVIRUS INFECTED CELLS

Jinghe Mao<sup>1\*</sup>, Dexter Whitley<sup>1</sup>, Locke Bryant<sup>2</sup>, and V.G. Chinchar<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Frog Virus 3 is a member of the family Iridoviridae. The cascade of viral gene expression is divided into two stages, early and late, that take places within the nucleus and cytoplasm, respectively. It has been hypothesized that both host and viral DNA dependent RNA polymerases II (Pol II) are involved in this process. Host Pol II is utilized for the transcription of immediate early and early genes, and viral transcriptional machinery (especially viral Pol II) is responsible for late gene expression. The objectives of this study are to localize the host and viral Pol II in mock and virus infected cells and to determine whether viral infection leads to a re-distribution and modification of host Pol II. An indirect immunofluorescent assay, using the 8WG 16 monoclonal antibody (specific to largest subunit of cellular Pol II), was done for visualization. In addition, western blot analysis was performed to detect for possible phosphorylation of Pol II. Preliminary data showed that host Pol II are mainly present within the nucleus of mock-infected cells, following infection, they migrated into cytoplasm and subjected to some modification. The results of this project will help us understand the mechanisms of transcriptional regulation in iridovirus-infected cells.

# 11:15 CHARACTERIZATION OF THE *ASPERGILLUS NIDULANS* snxB1 MUTANT PHENOTYPE

Ryan Day\* and Sarah Lea McGuire, Millsaps College, Jackson, MS 39210

The filamentous fungus *Aspergillus nidulans* grows by germ tube extension from a uninucleate spore. As the germ tube extends, the nuclei undergo synchronous mitosis and daughter nuclei migrate into the germ tube. After the third mitotic division, the cell begins to lay down incomplete septa, separating the hypha into numerous multinucleate compartments. While the general mechanisms that control mitosis are understood, the molecular mechanisms involved in coordination of septation (the equivalent of cytokinesis) and nuclear division remains a mystery. Our laboratory has recently identified snxB1, a mutation that suppresses the heat sensitivity of the nimX2cdc2 mutation and causes increased septation in the hyphae. This increased septation leads to smaller cell size and compact colony growth. We have begun experiments aimed at further characterizing the effects of the snxB1 mutation and at cloning the snxB gene by complementation of the mutant phenotype. Our preliminary results suggest that snxB1 causes loss of mitotic synchronization in cellular compartments following sublethal DNA damage and allows septation in the presence of hydroxyurea, but that the timing of mitosis in these mutants is similar to wild type. The mutant phenotype is osmotic remedial, which obfuscates cloning by complementation and selection. We are attempting to clone the gene by complementation and screening of transformants. Molecular characterization of this gene will allow a better understanding of the relationship between cytokinesis and nuclear division in this organism.

# 11:30 ANALYSIS OF PROTEINS ASSOCIATED WITH PP38 IN CELLS INFECTED WITH MAREK'S DISEASE VIRUS

Angela Pippin<sup>1</sup>\*, Ross Whitwam<sup>1</sup>, and Shane Burgess<sup>2</sup>, <sup>1</sup>Mississippi University for Women, Columbus, MS 39701, and <sup>2</sup>Mississippi State University, Starkville, MS 39762

Marek's disease (MD) virus (MDV) is a naturally-occurring lymphomagenic  $\alpha$ -herpesvirus of domestic fowl. MDV is also a model for human lymphomagenesis and for virus evolution towards hypervirulence. A 38 kiloDalton phosphoprotein (PP38), encoded by MDV, is expressed by MDV lytically-infected cells. PP38 is unique to MDV and, although not oncogenic, is critical to the pathogenesis of MD lymphoma. PP38's function remains enigmatic. Our goal was to identify proteins that interact with pp38 so as to infer the function of PP38 using proteomics—a so-called “guilt by association” approach. Associated proteins will be co-immunoprecipitated with PP38 from MDV-infected cells (using a monoclonal antibody). Protein identification will use liquid chromatography electrospray ionization tandem mass spectrometry. A source of MDV-infected cells was needed. Chicken embryo fibroblast (CEF) cells provide a source of cells for

MDV infection. We established viable primary and secondary in vitro chicken embryo fibroblast cultures. These cells were stored at -80 °C and resurrected when needed. Primary and resurrected CEF cultures were successfully infected with MDV in vitro. Plaque assays confirm infection and provided infection titers. Our results will allow work to begin towards immunoprecipitation of PP38 and its cellular partners. In parallel, and in preparation for the proteomics analysis, a number of proteomics experiments were done using model tissues. These proteomics experiments will be briefly described.

## FRIDAY AFTERNOON

Caprice

### Section V Organism Models

#### 1:30 REGULATION OF VIRULENCE FACTORS BY QUORUM SENSING IN *STAPHYLOCOCCUS AUREUS*

Davida Crossley\* and Mohamed O. Elasri, University of Southern Mississippi, Hattiesburg, MS 39406

*Staphylococcus aureus* is capable of causing a wide range of infections such as food poisoning, toxic shock syndrome, endocarditis, and osteomyelitis. Due to the increasing antibiotic resistance, it has become extremely important to find new targets to combat staphylococcal infections. One possible target is quorum sensing which allows *S. aureus* to regulate gene expression according to cell density. *S. aureus* uses a well characterized quorum sensing system, *agr*, to control the expression of several virulence factors. During growth, a signal molecule will accumulate in the medium as the number of cells increases. When cell density is low, surface proteins are expressed and when cell density is high, secreted proteins are expressed. Recently, a novel quorum sensing system (*luxS*) has been discovered in the marine bacterium *Vibrio harveyi*, where it regulates bioluminescence. *LuxS* has been discovered in a wide variety of bacteria. In *E. coli*, *Streptococcus pyogenes*, and *Clostridium perfringens*, *luxS* regulates virulence factors. In this study we will investigate the role of *luxS* in the regulation of virulence factors in *S. aureus*. We will examine the effect of *luxS* mutation on the expression of *agr*, *sarA*, and other virulence factors. We will also investigate the possible interaction between *luxS*, *sarA*, and *agr* system by examining the effect of *agr*, and *sarA* mutations on the expression of *luxS*.

#### 1:45 REGULATION OF VIRULENCE FACTORS IN *STAPHYLOCOCCUS AUREUS*

Karthik Sambanthamoorthy\* and Mohamed O. Elasri, University of Southern Mississippi, Hattiesburg, MS 39406

*Staphylococcus aureus* is an extraordinarily versatile pathogen causing a plethora of infections ranging from superficial infections (skin abscess, wound infections), to toxemic

syndromes (food poisoning), to life-threatening diseases (osteomyelitis, endocarditis). *S. aureus* has developed resistance to a wide range of antibiotics like methicillin and vancomycin, forcing the need for development of new drugs to combat staphylococcal infections. *S. aureus* expresses a wide variety of virulence factors. The virulence factors are either cell bound proteins (e.g., adhesins) or secreted proteins (toxins). The cell bound proteins are expressed early and repressed late during infection. On the other hand, the secreted proteins are repressed early and expressed late during the infection. The regulation of virulence factors is under the control of two global regulatory systems, the accessory gene regulator (*agr*) and the staphylococcal accessory regulator (*sarA*). The *agr* system is a quorum sensing system in which the *S. aureus* cells communicate with each other to coordinate expression of virulence factors. *sarA* regulates the virulence factors via two pathways, an *agr*-dependent pathway in which *sarA* activates *agr* at the transition between the exponential and post-exponential growth phase and an *agr*-independent pathway in which *sarA* regulates virulence factors directly. There is evidence for the existence of important upstream factors that modulate *sarA* function. Our goal is to identify and characterize these new factors which represent potential new therapeutic targets for the prevention and treatment of staphylococcal infections.

## 2:00 ANTIBIOTIC RESISTANT COLIFORM BACTERIA IN FECES OF FREE-RANGE AND COMMERCIALY RAISED CHICKEN

Daniel Murin\* and Sabine Heinhorst, Oak Grove High School, Hattiesburg, MS 39402, and University of Southern Mississippi, Hattiesburg, MS 39406

Antibiotic resistant bacteria are a problem that has become more apparent in recent years. While the origins of antibiotic resistant bacteria are unknown, there is strong evidence for a connection between the use of antibiotics in agricultural feeds and the emergence of coliform bacteria that are resistant to those antibiotics. In this study, 276 bacterial clones from chicken raised in commercial henhouses and 190 isolates from free-range chicken were screened for their resistance to ampicillin, tetracycline, and erythromycin. Plasmid DNA was subsequently extracted from 56 clones and examined by gel electrophoresis. Selected plasmids were used to transform a lab strain of *Escherichia coli*, and transformants were selected on media containing antibiotics. Plasmid DNA recovered from individual transformants was digested with restriction enzymes to compare the resulting DNA fragment patterns with those obtained from the plasmid DNA that was used to transform *E. coli*. Results from this study showed that antibiotic resistance was not limited to coliform bacteria from commercially raised chicken and was widespread among free-range animals. Plasmid DNA obtained from resistant bacterial isolates was capable of transferring the ampicillin resistance trait to *E. coli*.

## 2:15 CHEMICAL MODULATION OF AGE-DEPENDENT TISSUE DEGENERATION

Astrid Gutierrez-Zepeda\*, Zhixin Wu, Kenneth J. Curry, and Yuan Luo, University of Southern Mississippi, Hattiesburg, MS 39406

*Caenorhabditis elegans* is used to study aging and many human diseases due to its short life span and the existing genomic resemblance to humans. We have previously demonstrated that the *Ginkgo biloba* extract, EGb 761, extends life span of *C. elegans*. In this study, *C. elegans* were used to determine biochemical processes that regulate the onset of muscle degeneration due to aging, using chemical manipulation, behavioral assay, fluorescence microscopy, and electron microscopy (EM) techniques. An average of thirty *C. elegans* in each group were treated with vehicle EGb 761, nicotinamide (a chemical known to inhibit SIR-2 gene), or in combination. The motility behavior was scored based on the nematode's movement. Three different movements were set as standards: A movement (body movement without stimulation), B movement (body movement only with stimulation), and C movement (head movement only with stimulation). As the *C. elegans* grew older, the A movement declined and the C movement became prevalent. It was observed that nicotinamide caused an earlier onset of C movement in the nematodes, compared to the control and other treatments. Nicotinamide also hastened muscle degeneration, which was detected by fluorescence microscopy. Ultrastructure changes observed under EM showed a delay in the age-dependent muscle degeneration by EGb 761 treatment. These results suggest that muscle degeneration due to aging can be modulated by the use of certain drugs, probably via regulation of the longevity assurance genes.

## 2:30 EGb 761, AN EXTRACT OF GINKGO BILOBA LEAVES, ALLEVIATE TOXICITY INDUCED BY A $\beta$ IN TRANSGENIC C. ELEGANS MODEL OF ALZHEIMER'S DISEASE

Yanjue Wu\*, Zhixin Wu, Astrid Gutierrez-Zepeda, and Yuan Luo, University of Southern Mississippi, Hattiesburg, MS 39406

Alzheimer's disease (AD), the most common cause of decline in cognitive performance in elderly people, is associated with pathological features such as  $\beta$ -amyloid (A $\beta$ ) deposits, neurotic plaques, neurofibrillary tangles, and degeneration of synapses, neurons in the brain. Although the pathogenesis of AD is not fully understood, recent studies indicates that the A $\beta$  deposits and the local reactions of different cells play major roles in the development of the disease. We used an inducible A $\beta$ -expressing transgenic *Caenorhabditis elegans* strain CL4175 to correlate A $\beta$  deposits with its toxicity and with production of reactive oxygen species (ROS). Our results demonstrated that the A $\beta$  expression-induced paralysis was delayed in the *C. elegans* fed with EGb 761, an extract from the *Ginkgo biloba* leaves known to have neuroprotective effects. We also found A $\beta$  deposits in pharyngeal region of another

strain CL2006, which was engineered to constitutively express high levels of the human beta amyloid peptide, were significantly decreased in EGb761 treated *C. elegans* than those untreated controls. Using the immunoblotting, we show A $\beta$  oligmer dispersed in CL2006 after EGb 761 treatment. Our results indicated A $\beta$  toxicity in vivo could be offset by EGb 761, at least in part, via anti-oxidative and anti-oligomerization activities.

2:45 ATTENUATION OF ELEVATED OXIDATIVE FREE RADICALS IN ALZHEIMER'S DISEASE *C. ELEGANS* MODEL BY *GINKGO BILOBA* EXTRACT

Julie Smith\* and Yuan Luo, University of Southern Mississippi, Hattiesburg, MS 39406

Research indicates that cellular insults resulting from free radicals may be a major contributor to the neurotoxicity and pathology of Alzheimer's Disease (AD). According to the Amyloid  $\beta$  A $\beta$ -induced oxidative stress theory of AD, internal expression of A $\beta$  would cause a rise in the levels of reactive oxygen species (ROS). To determine whether ROS levels are increased by endogenous A $\beta$  expression, we employed an AD-associated transgenic *Caenorhabditis elegans* model constitutively expressing human AD. Significantly higher ROS levels were observed in AD-associated models compared to wild type counterparts. The elevated levels were attenuated by pretreatment with EGb761, a standardized *Ginkgo biloba* extract with potent antioxidant properties used extensively in clinical trials. Additionally, of the individual extract constituents tested, the most dramatic attenuation of ROS levels was achieved by pretreatment with the flavonoids, kaempferol, and quercetin. Validity of this assay is supported by using a superoxide dismutase (SOD)-deficient *C. elegans* strain displaying an oxidation-sensitive phenotype, showing a dramatic increase in ROS levels compared with controls. Furthermore, an age-dependent increase in H<sub>2</sub>O<sub>2</sub>-related ROS was observed in the wild type *C. elegans*, which was accelerated in the AD-associated *C. elegans* mutants. These results support the hypothesis of the involvement of A $\beta$  and ROS in association with AD, suggesting that in vivo modulation of intracellular oxygen free radical levels is one mechanism through which EGb761 provides neuroprotection.

3:00 Divisional Business Meeting

**CHEMISTRY AND  
CHEMICAL ENGINEERING**

Chair: Timothy J. Ward, Millsaps College  
Vice-chair: John Pojman, University of Southern Mississippi

**THURSDAY MORNING**

Chandeleur

Session A

9:30 EFFECT OF REHYBRIDIZATION ON THE ELECTRONIC STRUCTURE OF SINGLE-WALLED CARBON NANOTUBES

Mark Hamon<sup>1\*</sup>, Mikhail E. Itkis<sup>2</sup>, Sandip Niyogi<sup>2</sup>, and Robert C. Haddon<sup>2</sup>, <sup>1</sup>Millsaps College, Jackson, MS 39210, and <sup>2</sup>University of California, Riverside, CA

Single-walled carbon nanotubes (SWNTs) are expected to have a rich chemistry and the development of this subject will make available a unique set of materials. We have shown that chemical processing of short (100–300 nm in length), SWNTs allows the preparation of stable organic solutions of these materials. Related routes to soluble SWNTs have been reported, together with approaches involving side-wall functionalization. In order to systematize the chemistry of SWNTs, it is necessary to develop analytical tools for the detection and identification of the different species of SWNTs. Raman spectroscopy and near-infrared (NIR) spectroscopy have already been very useful in this regard.

9:45 AQUEOUS SOLVENT EFFECTS ON THE REGIOSELECTIVITY OF THE SINGLET OXYGEN ENE REACTION OF A SUBSTITUTED SULFIDE, SULFOXIDE, AND SULFONE

Ben Brock\* and Kristina L. Stensaas, Millsaps College, Jackson, MS 39210

The singlet oxygen photooxidations of 2,3-dimethyl-2-butenyl *p*-nitrophenyl sulfide, 1-[(*p*-nitrophenyl)sulfinyl]-2,3-dimethyl-2-butene, and 1-[(*p*-nitrophenyl)sulfonyl]-2,3-dimethyl-2-butene were conducted in deuterated chloroform, methanol-d<sub>4</sub>, and aqueous methanol-d<sub>4</sub> mixtures. Proton nuclear magnetic resonance spectroscopy was utilized to monitor the product distribution in each reaction. The results indicate that the strong hydrogen bonding capability of water affects the regiochemistry of each reaction.

# 10:00 COMPETITIVE OXIDATIONS OF BENZYL TRISULFIDE AND SUBSTITUTED ARYL DISULFIDES

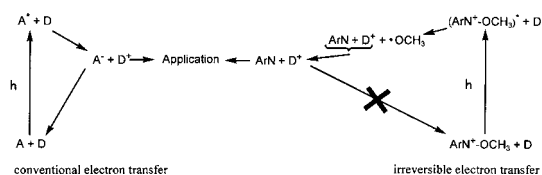
Seema Ahuja\* and Kristina L. Stensaas, Millsaps College, Jackson, MS 39210

The competitive oxidations of dibenzyl trisulfide and various substituted aryl disulfides utilizing *meta*-chloroperoxybenzoic acid will be discussed. Bis-*p*-acetylphenyl disulfide, bis-*p*-methylphenyl disulfide, and bis-*p*-methoxyphenyl disulfide were all oxidized in competition with benzyl trisulfide. The relative rates were determined using proton nuclear magnetic resonance spectroscopy. The results indicate that bis-*p*-acetylphenyl disulfide, which contains an electron-withdrawing group, is not competitive with the dibenzyl trisulfide. Both of the disulfides containing electron-donating groups, bis-*p*-methylphenyl disulfide and bis-*p*-methoxyphenyl disulfide reacted differently. Bis-*p*-methylphenyl disulfide was oxidized much slower than benzyl trisulfide whereas bis-*p*-methoxyphenyl disulfide was oxidized faster. We have attributed these results to several factors including the difference in oxidative reactivity between aryl and alkyl sulfides, the sulfur chain length effect, and the alkyl substitution effect.

# 10:15 IRREVERSIBLE PHOTOOXIDATION USING N-SUBSTITUTED HETEROAROMATIC SYSTEMS

Wolfgang H. Kramer\* and Ian R. Gould, Millsaps College, Jackson, MS 39210, and Arizona State University, Tempe, AZ 85287

The efficiency of photoinduced one-electron transfer reactions is often low due to return electron transfer in the initially formed radical-ion pair. The use of N-alkoxy-heteroaromatic compounds ( $\text{ArN}^+-\text{OR}$ ) avoids the return electron transfer process completely. Excitation of these compounds results in cleavage of the N-O bonds, and the formation of the radical cation of the parent heterocycle. This radical cation can be used to irreversibly oxidize an electron donor. In this work we have studied the synthesis, photochemistry and photophysics of a series of  $\text{ArN}^+-\text{OR}$  for use as irreversible photo-oxidants. Transient absorption and product analysis studies reveal that the quantum efficiencies for cleavage in the excited singlet state are indeed high, with in-cage recombination being probably the only energy wasting process. Compounds that cleave efficiently, with oxidizing abilities to 2 V vs SCE, and with absorptions as long as 450 nm have been identified. The cleavage fragments can be used to oxidize or nick DNA. Changing the oxidation potential of the radical cation with substituents can help select the mechanism of biomolecule cleavage.



# 10:30 Break

# 10:45 ENHANCED CAPILLARY LC-MS2 DETERMINATION OF BIOGENIC AMINES BY PRE-COLUMN DERIVATIZATION WITH 7-FLUORO-4-NITROBENZOXADIAZOLE (NBD-F)

Yi-Ming Liu\* and Yaru Song, Jackson State University, Jackson, MS 39217

This presentation describes a capillary LC-MS2 determination of biogenic amines enhanced by pre-column derivatization with 7-fluoro-4-nitrobenzoxadiazole (NBD-F). Biogenic amines including histamine, tryptamine, N-methylsalsolinol, and agmatine were studied. The NBD-biogenic amine derivatives were characterized by using tandem mass spectrometry and found to be mono-substituted except the one formed from N-methylsalsolinol which was di-substituted. The derivatives could be quantitatively enriched on 20 x 0.25 mm capillary column packed in house with 5 mm silica particles. In an electrospray ionization source, the fragmentation of these derivatives was effective and produced characteristic daughter ions. Agmatine was taken as the model compound for studying the analytical figures of merit. Detection limit was found to be  $4.5 \times 10^{-9}$  M agmatine and a linear calibration curve with an  $r^2$  value of 0.9996 was obtained in the range from  $1 \times 10^{-8}$  to  $1 \times 10^{-5}$  M agmatine. Tissue samples of rat brain, stomach, and intestine were analyzed. Minimum sample pre-treatment was needed and each LC-MS2 run was completed within 5 min. The highest level of agmatine was found in the stomach.

# 11:00 QUANTITATION OF BACTERIA VIA CAPILLARY ELECTROPHORESIS

Geoff Stone, David Smith, Bryant Jones, Stacy Ponder, Daisy Hamburg, Robert Nevins, and Timothy Ward\*, Millsaps College, Jackson, MS 39210

Identifying and quantization bacteria and other microorganisms is a difficult problem that is becoming increasingly important. The traditional method for characterizing microorganisms is by isolation of pure cultures. Compounding this problem is the fact that sample analysis is slow, thus limiting the number of samples that can be analyzed in a given time. At the present time, there are no reliable and easy to perform techniques for separating, identifying and quantization of intact microorganisms. Recently, a number of groups have explored the possibility of applying the technique of capillary electrophoresis in order to separate intact microorganisms such as bacteria and viruses. The application of this technique to this particular field of study would be advantageous, because it allows the bacteria to remain intact while being analyzed quickly and efficiently with broad applicability. In general, microorganisms tend to be amphoteric, containing multiple charges thus ideally suiting them for analysis by electrophoresis. We discuss the relevant characteristics associated with microorganisms that must be carefully controlled to achieve a useful separation as well as parameters affecting quantitation.



# 11:15 BINDING ENERGIES OF MONOVALENT AND DIVALENT CATIONS WITH TNT

Laura Lewis\* and David H. Magers, Mississippi College, Clinton, MS 39058

Trinitrotoluene is considered a teratogen and mutagen and therefore a major environmental hazard when it seeps into ground water. And yet, TNT is prevalent at artillery ranges, bomb sights, and anywhere explosives are used for any purpose, military or civil. The only current EPA-approved method for remediating TNT from soil is incineration, which is quite expensive. Other treatments are currently being investigated involving base hydrolysis of TNT. However, little is known about the mechanism of this reaction. Base hydrolysis always occurs in the presence of high concentrations of monovalent and divalent cations. Studies have shown that the intermediates of the alkaline hydrolysis of TNT can occur through radicals that have been observed in tight association with monovalent cations. In the present study, we began our investigation of this process by calculating the binding energy of TNT to such cations using SCF and density functional methods (DFT). The ground-state geometry and the corresponding electronic energy of trinitrotoluene, the energies of the Li, Na, K, Mg, and Ca cations, and the optimum geometries and energies of a TNT dimer with each cation were calculated. In these initial computations, each cation and dimer combination yielded a different optimized structure. Each of these is currently being used as a starting point for further geometry optimizations of the other four cations with TNT dimer, thus yielding up to five possible structures for each system. In each case, the most stable will be used to determine the binding energy. Every computation is being performed at both the SCF and DFT levels of theory with two basis sets: 3-21G(d) and 6-31G(d,p). We gratefully acknowledge the support of NSF EPSCoR (EPS-0132618).

# 11:30 CONVENTIONAL STRAIN ENERGY OF DIMETHYLSUBSTITUTED CYCLOBUTANES AND THE GEM-DIMETHYL EFFECT

Ashley L. Ringer\* and David H. Magers, Mississippi College, Clinton, MS 39058

The gem-dimethyl effect is the acceleration of cyclization by substituents in the chain and is often used in organic synthesis as a ring-closing effect. In the current study, calculations on methylcyclobutane, 1,1-dimethylcyclobutane, 1,2-dimethylcyclobutane, and 1,3-dimethylcyclobutane are performed to determine if this effect is at least in part a thermodynamic effect caused by lower strain energy or entirely a kinetic effect that lowers the activation barrier for the cyclization reaction. 1,1-dimethylcyclobutane is a four-membered carbon ring with gem-dimethyl substituents. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using SCF theory, density functional theory (DFT), and second-order perturbation theory (MP2). Compari-

sons are made between the conventional strain energy of cyclopropane and cyclobutane, methylcyclobutane, and the dimethyl-substituted cyclobutanes. Preliminary SCF and DFT calculations indicate that 1,1-dimethylcyclobutane is approximately 3 to 3.5 kcal/mol less strained than methylcyclobutane, which in turn is 3 to 3.5 kcal/mol less strained than cyclobutane. One hypothesis suggests that the strain energy is lower because the methyl groups have more freedom to move in the ring than in the open chain. Thus, there appears to be at least some thermodynamic component to the gem-dimethyl effect. The study continues by calculating conventional strain energies for the 1,2- and the 1,3-dimethyl substituted cyclobutanes. Additionally, the optimum geometries of the cyclic systems are examined, particularly noting the bonding angles in the rings, to study the relevance of geometry to the gem-dimethyl effect. We gratefully acknowledge the support of NSF EPSCoR (EPS-0132618).

## THURSDAY AFTERNOON

Chandeleur

Session A

# 1:30 CONVENTIONAL STRAIN ENERGY IN THE DIAZETIDINES, DIPHOSPHETANES, THIAZETIDINES, AND THIAPHOSPHETANES

Patricia Honea\*, Ashley L. Ringer, and David H. Magers, Mississippi College, Clinton, MS 39058

The conventional strain energies for the cis and trans conformations of 1,2-diazetidine, 1,3-diazetidine, 1,2-diphosphetane, and 1,3-diphosphetane together with the 1,2- and the 1,3- isomers of thiazetidine and thiaphosphetane are determined within the isodesmic, homodesmotic, and hyperhomodesmotic models. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using SCF theory, second-order perturbation theory (MP2), and density functional theory. The DFT functional employed is Becke's three-parameter hybrid functional using the LYP correlation functional. Two basis sets, both of triple zeta quality on valence electrons, are employed: 6-311G(d,p) and 6-311+G(2df,2pd). Additionally, single point coupled-cluster calculations using the optimized MP2 geometries and the larger of the two basis sets, are used to investigate the effects of higher-order electron correlation. Finally, the calculated strain energies are compared to those of cyclopropane, cyclobutane, azetidine, phosphetane, 1,2-oxazetidine, and 1,3-oxazetidine. We gratefully acknowledge support from NSF EPSCoR (EPS-0132618).

### 1:45 CONFORMATIONAL ENERGETICS OF NAPHTHYLQUINOLINES

Margie Lovell\*, David H. Magers, and Gary Reid Bishop, Mississippi College, Clinton, MS 39058

Naphthylquinoline derivatives satisfying hypothesized structural criteria for triplex DNA selectivity have been designed and synthesized. Proposed structural characteristic criteria promoting intercalation between bases of triplex DNA include: (i) a large aromatic surface area, (ii) an unfused flexible ring system, (iii) cationic, and (iv) crescent shape. Previous high-throughput competition dialysis experiments provided additional insights by demonstrating that the replacement of the secondary amine function found in the lead compound termed LS8 with an ether oxygen linkage greatly increased selectivity towards triplex DNA. Those experiments have been extended to include two additional compounds containing either a sulfur containing thiol or amide linkage. Here we present results from computational studies designed to examine the dynamic flexibility of the naphthylquinoline side-chain for the four compounds containing amine, ether, thiol, or amide linkages. Calculations are performed to determine the energy of each compound with varying dihedral angles between the side chain and the naphthylquinoline. Beginning from optimized geometries, the specific dihedral angle is frozen at 10-degree increments for values between 0 and 360 degrees and the rest of the structure is reoptimized to yield the energy barrier of the side-chain rotation and the approximate dihedral angle at which the top of the barrier lies. Calculations are performed using semiempirical theory, SCF theory, and density functional theory. We gratefully acknowledge the support of NSF EPSCoR (EPS-0132618).

### 2:00 THE THEORY AND USE OF LASER LINE DEFLECTION TO MONITOR ISOTHERMAL FRONTAL POLYMERIZATION

Lydia Lee Lewis\* and John A. Pojman, Millsaps College, Jackson, MS 39210, and University of Southern Mississippi, Hattiesburg, MS 39406

Isothermal Frontal Polymerization (IFP) is a method of converting monomer into polymer via a self-sustained propagating reaction zone that occurs when a solution of monomer and thermal initiator diffuse into a polymer seed creating a viscous region. Polymerization occurs in both the monomer solution and in the viscous region but occurs faster in the viscous region because of the Trommsdorff effect. As more monomer solution diffuses into the viscous region, new polymer forms, and a propagating, self-sustaining reaction occurs. IFP is used to produce gradient refractive index materials, which are materials containing a change in their refractive indices, e.g. fiber-optic cables for local-area networks. During the reaction, propagating isothermal fronts contain refractive index gradients as a result of the monomer solution diffusing into the polymer seed and the subsequent reacting front. These refractive-index gradients make detection

of the reaction zone impossible with the naked eye. Laser line deflection, light deflection through use of a line laser, has been developed to determine the position of the reaction zone within these systems. In addition, a mathematical algorithm has been developed to quantitatively determine the propagation distances as well as the front velocities and gradient profiles. The experimental apparatus and mathematical algorithm are discussed as well as their limitations, advantages, experimental and analytical error, and future directions of this field.

### 2:15 LIMITATIONS OF ISOTHERMAL FRONTAL POLYMERIZATION

Christopher A. Harris<sup>1</sup>\*, Lydia Lee Lewis<sup>1</sup>, and John A. Pojman<sup>2</sup>, <sup>1</sup>Millsaps College, Jackson, MS 39210, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

Isothermal Frontal Polymerization (IFP) is a directional polymerization that occurs when monomer and thermal initiator diffuse into a polymer creating a viscous region. The rate of polymerization in this viscous region is higher than in the solution of monomer and thermal initiator because of the Trommsdorff, or gel, effect, resulting in a propagating front. To determine the experimental conditions at which IFP occurs, systems of the monomer/polymer seed system of methyl methacrylate/poly(methyl methacrylate) were examined using the thermal initiator 2,2'-azobisisobutyronitrile (AIBN). These systems were run at various AIBN concentrations and cure temperature ranges to determine the limits at which homogeneous polymerization of the monomer solution occurred before front propagation could begin. Front propagation did not occur for solutions of 0.03% (wt/V) AIBN concentration above cure temperatures of 90 °C. This concentration limit increased with decreasing temperature until it was discovered that propagation occurred for saturated solutions at temperatures below 50 °C. For the conditions at which IFP occurred, the propagation distance was  $0.6 \pm 0.15$  cm regardless of initiator concentration and cure temperature.

### 2:30 Break

### 2:45 THE SYNTHESIS OF A POLYMERIC INHIBITOR FOR USE IN ISOTHERMAL FRONTAL POLYMERIZATION

Evan L. Underwood\* and Lydia Lee Lewis, Millsaps College, Jackson, MS 39210

Isothermal Frontal Polymerization is a self-sustaining, directional polymerization that occurs when a solution of monomer and thermal initiator come in contact with a polymer seed and create a viscous region where a higher polymerization rate, the gel effect, occurs. Monomer and thermal initiator continue to diffuse into this viscous region, and the polymer reaction proceeds in a vertical direction until homogeneous polymerization of the monomer on top of the front stops the front. To prolong the lifetime of the front, polymeric inhibitors of sufficient size to prevent diffusion into the forming polymer

matrix have been utilized. The free-radical scavenger 2,2'-6,6'-tetramethyl-1-piperidinyloxy has effectively prevented the polymerization of methyl methacrylate and has been incorporated onto a polymer backbone through the addition of substituted 2,2'-6,6'-tetramethyl-1-piperidinyloxy to low molecular-weight poly(methyl methacrylate). The polymeric inhibitor has been characterized through IR. Preliminary studies of the polymeric inhibitor's effectiveness show prolonged front behavior for fronts using the thermal initiator 2,2'-azobisisobutyronitrile with the monomer methyl methacrylate and poly(methyl methacrylate) seeds.

3:00 DETERMINATION OF THE EFFECT OF OXYGEN AND INHIBITOR ON AN ISOTHERMAL FRONTAL POLYMERIZATION SYSTEM VIA LASER LINE DEFLECTION

Daniel Antrim<sup>1\*</sup>, Svetlana I. Evstratova<sup>1,2</sup>, and John A. Pojman<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Rostov State Pedagogical University, Rostov-on-Don, Russia

Isothermal Frontal Polymerization (IFP) is a form of frontal polymerization that requires a polymer seed in order for a front to form. The seed is dissolved by the monomer forming a viscous region where polymerization occurs much faster than in the bulk of the solution—the newly formed polymer is likewise dissolved; thus propagating the reaction as a front. The purpose of this study is to more accurately characterize the IFP system—specifically, the effect of oxygen and inhibitor concentration on the front's velocity and propagation distance. For the oxygen study, a solution of monomer with initiator was flushed with oxygen for varying time periods before being poured into the reaction vessel. For the inhibitor study, solutions containing monomer with initiator and varying concentrations of inhibitor (2,2-diphenyl-1-picrylhydrazyl) were analyzed. Laser line deflection—an optical technique sensitive to refractive index gradients—was used to determine the position and velocity of the front. Results indicate that oxygen increases both propagation distance and velocity of the front by inhibiting bulk polymerization and by forming peroxides that increase polymerization in the viscous region. Results of the inhibitor study will be compared to modeling.

3:15 CONVENTIONAL STRAIN ENERGY IN UNSATURATED FOUR-MEMBERED RINGS

Shelley S. Huskey\* and David H. Magers, Mississippi College, Clinton, MS 39058

In order to study the effect of unsaturation on the ring strain in small cyclic molecules, the conventional strain energies for cyclobutene, azetidine-1-ene, phosphetane-1-ene, azetidine-2-ene, and phosphetane-2-ene are determined within the isodesmic, homodesmotic, and hyperhomodesmotic models. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular system using SCF theory,

second-order perturbation theory, and density functional theory (DFT). The DFT functional employed is Becke's three-parameter hybrid functional using the LYP correlation functional. Two basis sets, both of triple-zeta quality on valence electrons, are employed: 6-311G(d,p) and 6-311+G(2df,2pd). Finally, the calculated strain energies are compared to those of cyclopropane, cyclobutane, azetidine, and phosphetane. We gratefully acknowledge support from NSF EPSCoR (EPS-0132618).

3:30 CONVENTIONAL STRAIN ENERGY IN SMALL HETEROCYCLES OF CARBON AND SILICON

Crystal Coghlan\*, Shelley S. Huskey, and David H. Magers, Mississippi College, Clinton, MS 39058

The conventional strain energies for three- and four-membered heterocycles of carbon and silicon are determined within the isodesmic, homodesmotic, and hyperhomodesmotic models. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using SCF theory, second-order perturbation theory (MP2), and density functional theory. The DFT functional employed is Becke's three-parameter hybrid functional using the LYP correlation functional. Two basis sets, both of triple zeta quality on valence electrons, are employed: 6-311G (d,p) and 6-311+G(2df,2pd). Finally, the calculated strain energies are compared to those of cyclopropane, cyclobutane, oxaziridine, azetidine, phosphetane, diazetidine, and diphosphetane. We gratefully acknowledge support from NSF EPSCoR (EPS-0132618).

3:45 Divisional Business Meeting in Chandeaur

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THURSDAY MORNING

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Petit Bois

Session B

9:30 SEQUESTRATION OF TOXIC METALLIC IONS BY TIRE-DERIVED POWDER FROM THE WOMBAT PROCESS

Donald D. Bratton III\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

Toxic metal ions, such as copper, lead and mercury pose a serious ecological threat to humans, animals and vegetation if leaked into the environment. The WOMBAT process, an environmentally sound method of recycling tires into a viable fuel, produces a black powder derived from scrap tires. Third-party analysis of powder obtained from the WOMBAT process revealed that the tire-derived powder had the potential to sequester toxic metal ions. The purpose of the study was to determine to what extent WOMBAT powder could sequester a toxic metal ion, copper(II) chloride. A solution of aqueous copper(II) chloride was prepared to which tire-derived powder was added to and mixed overnight. UV-visible spectra

of the solution and X-ray fluorescence spectra of the separated and dried powder confirmed a significant increase in copper ion concentration within the WOMBAT powder as well as a significant decrease in copper ion concentration in solution. XRF analysis also showed no significant alteration in the composition of the powder other than the increase in copper.

#### 9:45 AN ANALYSIS OF THE BONDING CAPABILITIES OF WOMBAT POWDER WITH VARIOUS METALS

Veronika G. Viner\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

Scrap tires have littered landfills worldwide for years. Despite appearing to be useless garbage, scrap tires actually are a source of potentially valuable material and have been recycled for many useful applications. One potential application is to recycle the tires for previous metals such as copper. The Wertz oxidative method for processing scrap tire residual, shredded rubber scraps attached to steel wire, produces a powder that is known as WOMBAT powder. This powder was combined with first a copper salt and then with five different metals, calcium, cobalt, copper, mercury and lead in a solution in order to determine which metals would react with the powder and form bonds with it. These solutions were then filtered, dried and combusted before being analyzed with an x-ray diffractometer and x-ray fluorescence spectrometer. From x-ray fluorescence, it was found that a medley of metals, including mercury and copper, reacted with the WOMBAT powder. These results show that scrap tire residual are potentially useful material for obtaining valuable metals such as copper.

#### 10:00 A STUDY OF THE VALUE-ADDED PRODUCTS OF THE WOMBAT REACTION

Kate Vigour\*, Giselle Schnaubelt, Tara Craft, and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

A study of the used WOMBAT fluid produced by the WOMBAT tire recycling process was conducted. The used WOMBAT fluid was effectively used four times, which proved the smallest ratio of tire to WOMBAT fluid was 1:5. The spent fluid was neutralized and the potassium nitrate was crystallized. These crystals were used in the production of WOMBAT fertilizer. They were analyzed and compared to commercial Miracle-Gro fertilizer using x-ray spectrometry. Three types of plants were used to compare the WOMBAT fertilizer along with the commercial Miracle-Gro fertilizer. After weekly fertilization, the fully-grown plants were analyzed. The Miracle-Gro fertilizer produced the best results. However, the WOMBAT fertilizer produced better results than the plants grown in the absence of fertilizer. A base composition was developed based on the information obtained from this research.

#### 10:15 ENVIRONMENTAL X-RAY ANALYSIS ON SOIL AND VEGETATION EXPOSED TO SCRAP TIRE CHIPS

Holly R. Williams\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

Pieces of scrap tire and steel were deposited in the ground and the area was examined to determine if any metals from the tire chips were leaching into the ground. Vegetation commonly cultivated in Mississippi was also planted in a garden exposed to tire chips. X-ray fluorescence was used to monitor the soil samples over a tri-monthly basis. We found that concentrations of the elements found in the scrap tires and steel increased after a period of time; however some elements concentrations decreased over time. The cause of this may be due to bacteria in the soil. This study demonstrates that tires that are landfilled have the potential for increased toxicities to be incorporated into the ground and surrounding area.

#### 10:30 Break

#### 10:45 TEACHING AND LEARNING CHEMISTRY WITH THREE-DIMENSIONAL MOLECULAR MODELS

Robert C. Bateman, Jr., University of Southern Mississippi, Hattiesburg, MS 39406

Science teachers have long used three dimensional models for helping students learn about the three-dimensional world. Some familiar examples are the foaming clay volcano and topographic maps of geology and the molecular model sets of chemistry. Recently students have been able to utilize computer graphics with interactive images and animations to assist with learning in a variety of science disciplines. This presentation will review the use of three-dimensional molecular models in chemistry education, with a discussion of the various possible approaches to using these tools along with their pedagogical strengths and pitfalls. Emphasis will be on the mental models generated by the use of physical and computer graphic models of both small molecules and macromolecules.

#### 11:00 INTERFACIAL BEHAVIOR OF HYDROPHOBINS, A UNIQUE CLASS OF PROTEINS

Sonya D. Benson\*, Chang K. Hong, and Sarah E. Morgan, University of Southern Mississippi, Hattiesburg, MS 39406

An understanding of how natural polymers such as proteins adsorb onto various substrates is extremely important. The surface and interfacial behavior of these biopolymers including their adhesion and wettability characteristics determines where and how proteins and other biopolymers are used within their respective organisms. Therefore, detailed surface characterization of both the protein and substrate is required to understand the nature of protein behavior at surfaces and interfaces. A prediction of the adhesion and wettability behavior of hydrophobins, the most surface active proteins known to date, is determined using surface energy and solid/liquid interfacial tension theory. The surface energy and surface

tension of hydrophobin Sc3 isolated from the wood-rotting fungus *Schizophyllum commune* is determined using contact angle measurements. Contact angle measurements are obtained via the sessile drop technique using a range of solvents and substrates of varying polarity. A prediction of the adhesion and wettability behavior of Sc3 is made using methods and theories developed by Fowkes and Owens and Wendt. Atomic force microscopy is used to study the surface topography and morphology of Sc3 deposited onto substrates of differing polarity.

#### 11:15 METHYLENE KETALS AS BICHROMOPHORIC MODEL COMPOUNDS FOR LIQUID CRYSTALLINE POLY(ARYL CINNAMATES)

Stacy R. Burton\* and David Creed, University of Southern Mississippi, Hattiesburg, MS 39406

UV-Vis spectra of pure films of liquid crystalline (LC) polymers are almost invariably perturbed relative to those of simple model compounds in solution. We have been using several approaches to modeling the interchromophore interactions and perturbed electronic spectra of LC poly(aryl cinnamates). Ketals of methanal of general structure  $\text{ArOCH}_2\text{OAr}$  have a flexible 'spacer' group,  $-\text{OCH}_2\text{O}-$ , that should allow for maximum interchromophore interactions of the pendent aryl groups. Reaction of alkyl 4-hydroxycinnamate esters with  $\text{CH}_2\text{Cl}_2$  in N,N-dimethyl acetamide in the presence of  $\text{K}_2\text{CO}_3$  affords high yields of the bichromophoric compounds. These bichromophoric model compounds have been characterized by NMR, IR, and UV-Vis measurements. They show perturbed UV-Vis spectra but these spectra are unlike those seen in the LC polymers possibly reflecting significant perturbation of the cinnamate absorption spectrum by the polar effect of the  $\text{OCH}_2\text{O}$  substituent.

#### 11:30 DEMONSTRATION AND QUANTIFICATION OF THE EFFECTIVE INTERFACIAL TENSION IN AN ISOBUTYRIC ACID/WATER SYSTEM VIA SPINNING DROP TENSIONOMETRY

Colin Whitmore\*, Rosie Parker, Brian Zoltowski, and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

The existence of an effective interfacial tension (EIT) in a miscible solution is demonstrated and quantified. This is done by analyzing a binary system of isobutyric acid (IBA) and water with a spinning drop tensiometer (SDT). A solution of IBA and water is injected into a SDT set at a temperature below their demixing temperature. Here, two immiscible phases exist. The temperature of the tensiometer is then raised above the demixing temperature to make the two phases miscible. After allowing thermal equilibrium to be achieved, the EIT is measured through two methods. Rapidly lowering the rate of rotation causes the drop to break up via the Rayleigh-Tomottika instability. This provides definitive evidence of the EIT, and allows for a method through which its value is calculated. The

value so obtained is compared to that derived from the static drop via the Vonnegut formula. Acknowledgments: NASA's Microgravity Materials Science Program grants NAG8-1466 and NAG8-1858

### THURSDAY AFTERNOON

Petit Bois

Session B

#### 1:30 MOLECULAR DESIGN FOR NONLINEAR OPTICAL MATERIALS

Paresh Ray, Jackson State University, Jackson, MS 39217

In this presentation I want to emphasize mainly on the design strategy to maximize the Nonlinear Optical (NLO) properties of organic molecules. Series of push-pull neutral, ionic and Octupolar molecules are investigated to establish the structure/NLO- property relationships by carrying out the ab initio (HF/6-31G\*) calculations of the molecular first hyperpolarizability ( $\hat{\alpha}$ ). The solvent effects on the NLO properties are studied by using the self-consistent reaction field (SCRF) method. It is found that Bond Length Alternation (BLA), Donor-Acceptor properties, Ionic Strength and Solvent polarity are the main factors to be considered for designing nonlinear optical materials. We also compare our theoretical results with the experimental values wherever available in the literature, reported by us or other groups.

#### 1:45 PRODUCTION OF INITIATOR-CORE MICROCAPSULES AND ANALYSIS OF THEIR RELEASE PROPERTIES

Brian McFarland\* and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

Certain polymerization reactions are often designed to take place through a triggered release of an initiator and/or accelerator that has been enclosed in microcapsules that are dispersed throughout the reaction medium. These microcapsules can be designed to release their core contents through a variety of ways, including mechanical rupture, heat-triggered release, and slow release by gradual diffusion of the core out of the capsule shell. An in-depth study has been designed to examine the production of initiator-core microcapsules by various microencapsulation techniques, and to examine their release properties as both a dry powder and in storage in a liquid monomer medium. The examination of the release properties will give insight as to which types of microcapsules are best applied to certain polymerization applications.

2:00 POLYMER-DISPERSED AQUEOUS MATERIALS  
Kayce Leard-Aultman<sup>1\*</sup>, Dana N. Ho<sup>2</sup>, John A. Pojman<sup>1</sup>, Douglas Wicks<sup>1</sup>, and Charles Hoyle<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Kentucky State University

The focus of this study is to prepare hydrophobic polymeric materials in which the aqueous phase is distributed throughout the polymer matrix as droplets. The resulting material could respond to magnetic fields, electric fields, or volatile compounds, depending on the composition of the aqueous phase. Preliminary experiments involve preparation of microemulsion solutions of Aerosol-OT, Dodecyl acrylate, and water. The surfactant, Aerosol-OT is employed to encapsulate the aqueous molecules within a surfactant monolayer, and the films are created via photopolymerization. Exposure to ultraviolet light of approximately 30 mW/cm<sup>2</sup> produces a thin film of opaque polymer. The opaque characteristic of the thin film suggests that aqueous droplets have been distributed throughout the polymeric material, because for the material to be cloudy the droplets must be larger than a wavelength of light. It is known that the droplets can aggregate to different degrees, and it may be possible to follow the evolution of droplet coalescence by imaging the films after different amounts of exposure to UV light. The appearance of the films will alternate from opaque to transparent, depending on the environment in which the material is contained, and a polymer thin film responsive to humidity and water in the air has been created. The current goal is to develop the most accurate and effective imaging technique for viewing the droplets within the matrix. Presently, phase contrast microscopy has been successful in proving that the droplets are there, but other imaging techniques will be used to gather measurements of the actual droplet size.

2:15 MISCIBLE FLUIDS IN MICROGRAVITY (MFMG)  
John A. Pojman<sup>1\*</sup>, Nick Bessonov<sup>2</sup>, and Vitaly Volpert<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Universite Lyon I, France

We use a model consisting of the heat and diffusion equations with convective terms and of the Navier-Stokes equations with an additional volume force written in the form of the Korteweg stresses arising from nonlocal interaction in the fluid. It is proportional to the square of the composition gradient with the proportionality coefficient depending on temperature. We performed simulations of drops and streams of miscible fluids and showed that it is possible for transient phenomena to occur that are similar to that observed with immiscible fluids. Specifically, we show that an aspherical drop can spontaneously become spherical and that a stream of a fluid can exhibit a Rayleigh instability. We also simulated a miscible drop migrating in a temperature gradient. The MFMG experiment is a zero-upmass experiment to be performed with Russian honey and water on the International Space Station.

2:30 Break

2:45 DETERMINING VISCOSITY NONINVASIVELY USING FLUORIMETRIC TECHNIQUES

Sammy Popwell\*, Kayce Leard-Aultman, Victor Wyatt, Joshua U. Otaigbe, and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

A noninvasive method of measuring viscosity during the adiabatic photopolymerization of dodecyl acrylate is being developed for use in an experiment on the international space station. The goal is to achieve viscosity measurements by monitoring the increase in intensity of pyrene and the ratio of monomer to excimer fluorescence of bis-pyrene. The fluorescence of both are being measured as a function of polymer concentration and temperature in an attempt to correlate the fluorescence intensity and viscosity.

3:00 INVESTIGATING SPIN MODE PATTERNS IN SPHERICALLY PROPAGATING POLYMERIZATION FRONTS

Hitish Nathani\*, Sammy Popwell, and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

Frontal Polymerization involves the conversion of monomer to polymer via a localized reaction zone that propagates through an unreacted solution of monomer and initiator. This study focuses on the expansion of three-dimensional frontal polymerization systems in which spin modes migrate around the periphery of the front. Spin modes are unique dynamical patterns caused by thermal instabilities. The viscosity dependence of spin modes in the frontal polymerization of Trimethylolpropane ethoxylate triacrylate, 1,6-hexanediol diacrylate (HDDA), and Aliquat Persulfate (thermal initiator) have been studied. Silica gel was added to increase the viscosity of the solution. It has been determined that the appearance of spin patterns decrease with increased viscosity, thus spin modes in polymerization systems are viscosity dependent. Spherically-propagating frontal polymerization and indications of spin modes in high viscosity have been achieved.

3:15 INVESTIGATION OF FRONTAL POLYMERIZATION IN A THIOL-ENE SYSTEM

Alford Perryman, University of Southern Mississippi, Hattiesburg, MS 39406

Thiol-ene thermo initiator proceeds via a sequential radical propagation/chain transfer mechanism that leads to polymer and network formation much like a step growth polymerization. Thiol-enes are advantageous over traditional acrylate systems in that they exhibit low oxygen inhibition during cure and have the ability to form thin and thick cures. The frontal polymerization of the Thiol-ene allows conversion of the monomers into polymer via localized reaction propagation. In this study, the velocity and temperature profiles of a frontal polymerized Thiol-ene system were determined. Thiol-ene frontal polymerization is new, so determining these

dependencies is essential for determining the potential applications.

### 3:30 FRONTAL POLYMERIZATION IN THIOL-ENE AND THIOL-ACRYLATE SYSTEMS

Birsen Varisli, University of Southern Mississippi, Hattiesburg, MS 39406

We demonstrate for the first time frontal polymerization with a thiol-ene system. We studied Pentaerythritol Triallyl Ether (PTE) and Trimethylolpropane tris (3-mercaptopropionate) (TT1) with Luperox 231 as a free-radical peroxide initiator. We determined the front velocity as a function of the initiator concentration and the ratio of PTE:TT1. A stoichiometric ratio produced the maximum front velocity. Nonstoichiometric ratios produced nonplanar modes of propagation, so called, 'spin modes.' We also studied a mixed thiol-diacrylate system in which the thiol significantly reduced the inhibition from dissolved oxygen.

### 3:45 Divisional Business Meeting in Chandeaur

## FRIDAY MORNING

### Chandeaur

### 8:45 Divisional Poster Session

#### PREPARATION OF SALSOLINOL STEREOISOMERS USING CHIRAL HPLC TO MONITOR SEPARATIONS

Bradley Cheek, Chris Strawbridge, John McCoy, and Kenneth McMurtrey\*, University of Southern Mississippi, Hattiesburg, MS 39406

In this paper a racemic mixture of salsolidine (the methoxy derivative of salsolinol) was separated into its two enantiomers using D- and L-tartaric acid, which separated (+)-salsolidine into R-salsolinol and S-salsolinol, respectively. Racemic salsolidine was combined with D-tartaric acid and methanol added to the mixture. One of the diastereomeric salts, S-salsolidine-D-tartrate was obtained and purified by Crystallization. The R-salsolidine-D-tartrate salt, which is relatively soluble in methanol, was extracted into chloroform from a basic solution giving salsolidine as predominantly the R-isomer. This was mixed with L-tartaric acid and was recrystallized from methanol to give the purified R-salsolidine. The two isolated stereoisomers were then demethylated in refluxing concentrated HBr to give the two salsolinol stereoisomers. S-(-)-salsolinol-HBr was obtained in 97.7% purity and R-(+)-salsolinol-HBr in 98.8% purity as measured by reversed-phase HPLC using sulfated  $\beta$ -cyclodextrin as modifier in the mobile phase. Polarized light measurements indicated that these measurements of optical purity was essentially correct.

#### THE PURIFICATION OF ESTRONE SULFATASE

Marie Winston<sup>1\*</sup>, Theodore S. Widlanski<sup>2</sup>, and Cheri Stowell<sup>2</sup>,

<sup>1</sup>Alcorn State University Alcorn State, MS 39096, and <sup>2</sup>Indiana University, Bloomington, IN 47401

Included with in a human placenta are many diverse proteins. Among those proteins are membrane proteins. These membrane proteins are comprised of an enzyme known as estrone sulfatase. Breast tumors produce increasing levels of estrone sulfatase activity, and a majority of breast tumors are estrogen dependent. Therefore, the purification and isolation of membrane proteins containing estrone sulfatase is vital to producing chemotherapeutic intervention in breast cancer. Purification of these membrane proteins that house estrone sulfatase can be accomplished by several methods including chromatography separation and electrophoresis. Here, the chromatography separation method is employed. However, there are many forms of chromatography separation. The form used here is ion exchange chromatography. This purification was carried out to extract membrane proteins out of a human placenta in order to gain access to the estrone sulfatase activity level in which these proteins exhibit. Although future chemotherapeutic advancements for breast tumors are not known at this time, the results of this purification showed promising levels of estrone sulfatase activity.

#### THE DIFFERENCES BETWEEN FRESH AND DRIED *BACOPA MONNIERI*

Padma Venkat<sup>1</sup>, Bettaiya Rajanna<sup>2</sup>, Preeti Sudha<sup>1</sup>, and Roger Holloway<sup>2\*</sup>, <sup>1</sup>Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore, India, and <sup>2</sup>Alcorn State University, Alcorn State, MS 39096

This research was carried out by the author in association with the scientists at Foundation for Revitalization of Local Health Traditions (FRLHT), Bangalore, India, in summer 2003 as part of Minority International Research Training (MIRT) program. A major goal of FRLHT is to revitalize traditional local health cultures and practices by challenging to demonstrate their contemporary relevance to serve the country's present and future health care needs. According to Charak Samhita, a classical Ayurvedic text, *Bacopa monnieri* has been a part of Indian culture since the time of Atharva-ved. A naturally occurring herb, *Bacopa monnieri* has been used to treat mental diseases and as a nerve tonic. The use of *Bacopa monnieri* in Indian Ayurvedic medicine for memory enhancement goes back 3000 years or more. Both fresh (green and wet) and dried form of the plant are used. The purpose of this study was to evaluate the differences or similarities in the medicinal characteristics between fresh and dried *Bacopa monnieri* plant. The morphological characteristics of the plant was authenticated and described with the help of a qualified botanist. Plants were harvested and stored in the laboratory at appropriate temperature. Prescribed samples of plant material were selected from the original stock. Laboratory tests for morphological description, foreign organic matter content, moisture, total ash, acid insoluble ash, water soluble extract, alcohol soluble extract and bacoside content were performed. Thin Layer Chromatog-

raphy (TLC) was used for identification and finger printing. (Supported by NIH/FIC/MIRT # 5 T37 TW00132)

#### ANALYSIS OF ENTEROSTATIN IN CEREBROSPINAL FLUID AND RAT BRAIN BY HPLC-MS/MS

Kristina Vaughn\*, Yi-Ming Liu, and Yaru Song, Jackson State University, Jackson, MS 39217

Obesity has been linked to mechanical, metabolic, and physiological adverse public health effects. Although some cases of obesity are linked to hereditary factors, high fat consumption remains the chief contributor to the large obese population. Enterostatin, a group of neuropeptides, have been correlated with reduction of high fat intake. Enterostatin is produced in the gastric mucosa and small intestine. Enterostatins include several pentapeptides, [Val-Pro-Asp-Pro-Arg (VPDPR), Val-Pro-Gly-Pro-Arg (VPGPR), and Ala-Pro-Gly-Pro-Arg (APGPR)], which are found in varying abundances in the human cerebrospinal fluid and rat brain. The purpose of this study is to effectively determine the dominant form of enterostatin in human cerebrospinal fluid and rat brain using high performance liquid chromatography coupled with mass spectrometry analysis. Other aspects include determining solution makeup for the bioactive form of APGPR, by analyzing APGPR in various compositions. Samples obtained by the laboratory were resolved on a C18 reversed-phase column using a ternary mobile phase consisting of methanol, acetonitrile, and water. These samples were analyzed with HPLC coupled with Mass spectrometry detection. Analysis demonstrates that APGPR is the dominant form of enterostatin in human cerebrospinal fluid and rat brain. The levels of APGPR were  $98.3 \pm 16.3$  ng/ml of human cerebrospinal fluid and  $30.1 \pm 12.6$  ng/g wet tissue of rat brain sample. This research was supported by NIMH-COR grant MH-16926.

#### PHOTOCHEMICAL DEGRADATION OF NITRO POLYCYCLIC AROMATIC HYDROCARBONS

Generique Stewart\*, Jian Yan, Lei Wang, and Hongtao Yu, Jackson State University, Jackson, MS 39217

Polycyclic Aromatic Hydrocarbons (PAHs) are a class of widely spread mutagenic and tumorigenic environmental contaminants. Nitro-polycyclic aromatic hydrocarbons (nPAHs) are derivatives of PAHs, and contain two or more fused aromatic rings made of carbon and hydrogen atoms. They are formed as a result of incomplete combustion of organic material both from natural events and human activities. N-PAHs are of primary concern because most of them are more carcinogenic than their parent PAHs, and also display a great degree of mutagenicity. They occur in the environment in the vapor phase or absorbed to particulate matter. Photochemical reaction rate of 6-nitrochrysene (6-NC), 1,3-dinitropyrene (1,3-DNP), 1,6-dinitropyrene (1,6-DNP), 1,8-dinitropyrene (1,8-DNP), 1-nitropyrene (1-NP), and 2-nitropyrene (2-NP) were studied. The samples were premixed in methanol, diluted to a desired concentration with acetonitrile/water (80/20), then

irradiated by UVA light ( $144 \text{ J/cm}^2 \cdot \text{h}$ ). The degradation of each compound was monitored by RP-HPLC. The peak intensity was recorded and plotted versus irradiation time,  $\ln [A] = \ln [A]_0 - kt$ , to obtain reaction rate constant  $k$  and then degradation half-life,  $t_{1/2} = 0.693/k$ . 1,3-, 1,6-, and 1,8-DNP and 1- and 2-NP have half-lives of 60, 15, 20, 18, and 23 min, respectively. Photoproducts of all the above nitro-PAHs are being investigated. This research is supported by Army Research Office for student stipend and NIH SCORE S06GM08047.

#### THE ACCURATE CALCULATION OF RO-VIBRATIONAL EIGENENERGIES OF HOD

Jennifer L. Curry\* and Joseph A. Bentley, Delta State University, Cleveland, MS 38733

We report the accurate calculation of ro-vibrational eigenenergies of the ground electronic state of the HOD molecule. The Radau coordinate system ( $R_1$ ,  $R_2$ ,  $\theta$ ) is employed. The discrete variable representation (DVR) [Z. Bacic and J.C. Light, *Annu. Rev. Phys. Chem.* 40, 469 (1989)] is used as a basis for both radial coordinates—this leads to a sparse Hamiltonian matrix. A primitive angular basis set is constructed which diagonalizes the rotational ( $J > 0$ ) kinetic energy operator; subsequently, this basis is contracted through a series of diagonalizations of smaller Hamiltonian matrices. The final Hamiltonian matrix is then constructed out of this contracted angular basis set. The eigenvalues of this matrix are then obtained by using the Implicitly Restarted Arnoldi Method (IRAM) which is part of a recently developed numerical package (ARPACK) designed to solve large scale eigenvalue problems.

#### SYNTHESIS AND ANALYSIS OF PHTHALOCYANINE DYES THAT ABSORB AT 680 TO 780 NM

Terry Jones<sup>1</sup>\*, Amber J. Countryman<sup>2</sup>, Guifa Su<sup>2</sup>, and Robert P. Hammer<sup>2</sup>, <sup>1</sup>Delta State University, Cleveland, MS 38733, and <sup>2</sup>Louisiana State University, Baton Rouge, LA

Phthalocyanines (Pcs) are near-IR fluorescence dyes, which have widespread biological and chemical applications due to their large extinction coefficients and good fluorescent quantum yields. Additionally, they have excellent chemical and photochemical stability. Absorbance and fluorescence can be altered easily by changing ring substituents or the metal center (Zn, Sn, Ga, Al, etc.). The downside is that the Pc dyes are hydrophobic and water insoluble. There have been experiments, however, which have found some water-soluble tetra- and octa-substituted Pcs by adding groups like sulfonates, carboxylates, or phosphonates. The overall goal of this research is to find near-IR fluorescent dyes to allow a multiplex of analytical methods. There are many different derivatives of the phthalocyanine dyes. Our synthesis of the dyes involved making and purifying a precursor, a phthalonitrile, and using it to synthesize a Pc. We synthesized our octasubstituted Pc by following similar procedures used to make other tetra- and octasubstituted dyes in the past. Zinc was used as the metal



center for the dye, and the substituents were alkenes. The dye, 1,4,8,11,15,18,22,25-octakis(3-butenyloxy)phthalocyanine, was purified by column chromatography. The procedure gave high yields and pure products. Further tests were run to oxidize the substituent groups on the Pc without changing the entire structure of the Pc. These tests are run to determine if the dye will have a near-IR absorbance with different substituent groups, like carboxylic acids or esters. Finally, the Pcs were characterized by proton NMR, UV-VIS (200–800nm), and by measuring fluorescence and the lifetime.

#### AN AB INITIO STUDY OF C-H...O HYDROGEN BONDING IN PEPTIDE MODELS

Amy Rowe, Delta State University, Cleveland, MS 38733

Hydrogen bonding involving the alpha carbon of a peptide backbone occurs frequently in proteins. Due to the lack of knowledge about the strength of these weak hydrogen bonds, however, the importance and function they serve in proteins is ambiguous—high level *ab initio* calculations performed on n-formylalanine-amide and acetamide offer evidence of a hydrogen interaction between the alpha carbon of alanine with the carbonyl oxygen of acetamide. The geometries for n-formyl-alanine-amide and acetamide were optimized using density functional theory (DFT) at the BLYP level and 3-21G, 6-31G\*, and 6-311G\*\* basis sets. Scans of the CH...O hydrogen bond distance at varying C-H...O bond angles were computed at the 6311G\*\*/MP2 level. Results show that the binding energies of some of the C-H...O hydrogen interactions have sufficient strength. Therefore, C-H...O hydrogen bonding and may be considered a factor in protein structure and function.

#### SURFACE ANALYSIS OF PLURONIC-TREATED SURFACES USING CONTACT ANGLE TESTING METHODS

Fayth Davis\*, Shay Thigpen\*, Sonya D. Benson, Chang K. Hong, and Sarah E. Morgan, University of Southern Mississippi, Hattiesburg, MS 39406

Pluronics are tri-block copolymers that contain poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide) (PEO-PPO-PEO) segments. Their surfactant abilities and compatibility in the human body make them of interest for potential biomedical applications. Studies show that the copolymer self-assembles onto a substrate depending on the characteristic of the substrate. For example, if the substrate is hydrophobic, the PPO segment of the Pluronics will adhere to the substrate, while the PEO segments remain to render the surface hydrophilic. We utilized contact angle measurements to analyze the surfactant properties of Pluronics when deposited onto hydrophobic substrates, including polystyrene and Teflon. Pluronics solutions of varying molecular weights and concentrations were evaluated. Effects of application method, concentration, polymer type and molecular weight on deposited films were explored. Varying levels of surface modification were observed.

#### GROWTH AND ISOLATION OF THE HYDROPHOBIN SC3 SECRETED BY THE WOOD-ROTTING FUNGUS *SCHIZOPHYLLUM COMMUNE*

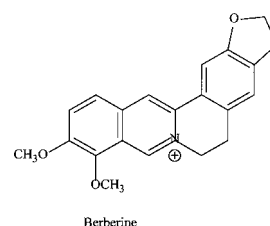
Ashley Grant\*, Jeremy Yarbrough\*, Sonya D. Benson, Chang K. Hong, Gordon C. Cannon, Charles L. McCormick, and Sarah E. Morgan, University of Southern Mississippi, Hattiesburg, MS 39406

Hydrophobins are a unique class of proteins discovered in the mid 1980s. These proteins exhibit remarkable self-assembly and high surface activity. The hydrophobin Sc3 secreted by the wood-rotting fungus Sc3 is the most surface active protein known to date and is highly studied for potential use in technical, cosmetic, pharmaceutical, and biomedical applications. Before the self-assembly and surface-active behavior of Sc3 can be analyzed, it must be isolated from the fungus *Schizophyllum commune*. The growth of the fungus and subsequent isolation of the protein Sc3 has proven to be significantly challenging to date with approximately 2 mg to 60 mg of Sc3 isolated from one liter of growth medium. We have chosen to explore various growth mediums and protein isolation methods and techniques to obtain consistent and increased yields of the hydrophobin Sc3. We have studied the effect of varying concentrations of sugar, amino acids, and salts to the growth medium of *Schizophyllum commune*. In addition, we have also explored the use of various protein separation techniques including hydrophobic interaction chromatography to obtain more highly purified yield of the hydrophobin Sc3.

#### STRUCTURAL AND THEORETICAL STUDY OF BERBERINE HEMISULFATE BY NMR AND COMPUTATIONAL CHEMISTRY

Sharon Hurley, Ming-Ju Huang, and Ken S. Lee\*, Jackson State University, Jackson, MS 39217

The structure of berberine hemisulfate was analyzed by NMR Spectroscopy. A series of spectra of 1D and 2D NMR including long-range coupling were taken for the analysis. Every carbon and hydrogen was assigned based on the spectra taken and their chemical shifts were compared with other report. The structure of berberine has been fully optimized by *ab initio* methods. The  $^1\text{H}$  and  $^{13}\text{C}$  NMR chemical shifts of berberine hemisulfate were calculated by means of GIAO and other methods. The results from theoretical calculations were compared with experimental data for chemical shifts. The structure of berberine in the solid state was compared with our theoretical molecular properties.



# DETERMINATION OF CHROMIUM CONCENTRATION IN THE ACID-HYDROLYZATE FROM SAWDUST BY ATOMIC ABSORPTION SPECTROSCOPY.

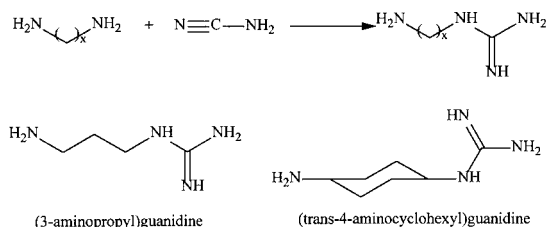
Lenore Hicks, Delphine Woody, and Ken S. Lee\*, Jackson State University, Jackson, MS 39217

In the project to produce ethanol from the sawdust via acid-hydrolysis and fermentation, the extruder made of stainless steel with a high concentration of sulfuric acid was used for hydrolysis of sawdust. High concentration of sulfuric acid erodes the metal and releases metal ions into the acid-hydrolyzate in the process of hydrolysis. Therefore it is necessary to analyze metal ions in the solution. Especially the chromium ion needs to be determined, since this ion can harm the fermentation process later. The paste from the extruder was treated with water in a 1:1 weight ratio and the solution was analyzed by Atomic Absorption spectroscopy (AA). The analysis indicated that the solution had 20 ppm of chromium ion. The project is supported by DOE EPSCOR.

# SYNTHESIS, STRUCTURAL, AND THEORETICAL STUDY OF AGMATINE DERIVATIVES VIA CYANOAMINE

Ken S. Lee<sup>1\*</sup>, G.B. Yi<sup>2</sup>, Ming-Ju Huang<sup>1</sup>, and Lenore Hicks<sup>1</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Two agmatine derivatives, (3-aminopropyl)guanidine and (trans-4-aminocyclohexyl)guanidine, were synthesized from cyanoamine and the corresponding diamines. <sup>1</sup>H and <sup>13</sup>C NMR were used to confirm the structures of the two products. The structures of synthesized agmatine derivatives were fully optimized by *ab initio* methods. The <sup>1</sup>H and <sup>13</sup>C NMR chemical shifts were calculated by means of GIAO and other methods. The results from theoretical calculations were compared with experimental data for chemical shifts.



# CHEMICAL EXCITATION OF TiO IN DIFFUSION FLAME

Chandra M. Pathak, Alcorn State University, Alcorn State, MS 39096

Electronic excitation of molecular species such as C<sub>2</sub>, formed in the flame produced by burning butane in air, has been fairly well known. The study of such flames have yielded spectroscopic data of considerable interest and importance involving both the ground state and the upper electronic states of the molecules formed in the flames. The present study was undertaken in the expectation that under appropriate conditions of excitation in a diffusion flame, a diatomic or a tri-atomic

species can be formed in an excited state and an electronic transition to a lower state may give rise to a new electronic band system in the molecule formed in the flame. Diffusion flames have in the past given rise to a number of new electronic band systems of several species as a consequence of the highly exothermic elementary reactions occurring in such systems which produce overpopulations of certain excited states, yielding emission that would be unobservable under thermal excitation. Four new electronic band systems were observed in the emission spectrum of a lowpressure diffusion flame of TiCl<sub>4</sub> plus oxygen burning in potassium vapor. The new systems, all of which lie in the ultraviolet region, are attributed to TiO. Two of them have also been observed in emission from a TiBr<sub>4</sub>O<sub>2</sub>-K flame. One system appears to involve transition to the ground, X<sup>3</sup>Δ<sub>g</sub> state. The lower state of the other three systems seems to be the low-lying singlet state of TiO. The new bands permit two new excited states to be located with some certainty: a triplet state at 32,000 cm<sup>-1</sup> and a <sup>1</sup>Σ state at 30,970 cm<sup>-1</sup>.

# THE INTERACTION OF URIC ACID AND METAL CATIONS

R.N. Allen\*, M.K. Shukla, and Jerzy Leszczynski, Jackson State University Jackson, MS 39217

A detailed investigation of the interaction of urate with Li<sup>+</sup>, Na<sup>+</sup>, and K<sup>+</sup> were carried out using a variationperturbation energy decomposition scheme defining sequence of approximate intramolecular interaction energy model. The geometries of urate metal complexes were optimized using Density Functional Theory Becke-3 parameter Lee, Yang, Parr (B3LYP) level employing the 6-311++G(d,p) basis set. The nature of potential energy surfaces was ascertained by harmonic vibrational frequency analysis. Our results show that the most electronegative area of the urate molecule is the N3 site which has the strongest affinity for metal cations.

# SYNTHESIS AND CHARACTERIZATION OF TIN(IV) COMPLEXES OF DI-2-PYRIDYL <sup>4</sup>N-ETHYL AND <sup>4</sup>N-PHENYL THIOSEMICARBAZONE

Ramaier Venkatraman, Jackson State University, Jackson MS 39217

α-N-heterocyclic acetyl and formyl thiosemicarbazones and their metal complexes have been known for their cytotoxicity and inhibiting activity against DNA synthesis under controlled conditions. Under this class, several derivatives of formyl and acetylpyridines and their metal complexes bearing 4N mono and 4N4N-disubstituted compounds have been extensively studied. Due to their biological significance and proven capabilities as antifungal, anti-neoplastic and antileukemic agents, herein we present the synthesis, structure and characterization of some tin(IV) complexes of di-2-pyridyl ketone thiosemicarbazone, and their 4N-ethyl and phenyl derivatives. The ligands and complexes were characterized by FTIR, <sup>1</sup>HNMR, UV-Visible spectroscopic methods. The nature

of these complexes was analyzed on the basis of their electrical conductivity measurement.

#### Divisional Talks

##### 10:30 PREPARING OLIGOMERS OF MANDELIC ACID TO BE TESTED FOR ANTI-HIV ACTIVITY

Jelani Griffin<sup>1\*</sup>, Victor Wyatt<sup>2</sup>, and John A. Pojman<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

Mandelic acid,  $C_8H_8O_3$ , is an antiseptic commonly used for urinary tract infection. However, further research has shown that when reacted with sulfuric acid, the product can inhibit the replication of HIV-1. The racemic (+) or (-) mandelic acid was reacted with toluenesulfonic acid and benzene for synthesis using the Dean-Stark trap apparatus. Through mandelide synthesis, the product was obtained and characterized using gel permeation chromatography (GPC). From GPC analysis, it was determined that when synthesized, products are dimers rather than trimers. The R,R, S,S, and R,S oligomers were sent to the New York Blood Center to be test the anti-HIV-1 antiviral activity of the 3 compounds. They all were inactive. At the highest level used, 1.5 mg/ml, there was a slight reduction of virus production. No effect was seen at 0.75 mg/ml and higher 2-fold dilutions. The compounds also did not inhibit the binding of the virus surface protein to a soluble form of the cellular receptor.

##### 10:45 INVESTIGATION ON SUICIDE INACTIVATION OF CHLOROPEROXIDASE

Jianping Xu\*, Wei Lin\* and Xiaotang Wang, Jackson State University, Jackson, MS 39217

Chloroperoxidase (CPO) is a highly versatile heme enzyme that catalyzes the transformation of a broad range of substrates. CPO catalyzes chlorination, epoxidation, hydroxylation and asymmetric sulfoxidation reactions at the expense of  $H_2O^2$  or ROOH. Many of these reactions, especially epoxidation of alkenes, can lead to enantiomerically enriched chiral products. Despite the extensive research on CPO catalyzed alkenes epoxidation, little is known about the mechanism of these reactions. A few mechanisms were proposed; all of them involved a key oxoiron intermediate. It is believed that the native enzyme (CPO) reacts with hydrogen peroxide to generate an oxoiron(IV) porphyrin cation radical species during both epoxidation and suicide inactivation. To confirm this mechanism, we investigated the CPO catalyzed epoxidation of allylbenzene. The experiments were conducted with and without KCN. Without KCN, CPO was converted to an inactive green species which was consistent with previous reports. As evidenced by the red-shift 410 nm (to 418 nm) of the optical spectra of CPO. With the addition of KCN, the band red-shifted to 439 nm from original 400 nm, then quickly blue-shifted to 418 nm after the addition of hydrogen peroxide. It is well known that  $CN^-$  is a more powerful ligand to  $Fe^{3+}$ , the sixth

ligand position of  $Fe^{3+}$  in active site must be occupied by  $CN^-$  and this would prevent the formation of an oxoiron(IV) porphyrin cation radical species. The fact that CPOCN also afford the formation of green pigment of with allylbenzene suggests that there is alternative path to convert CPO to green species. This preliminary result showed that current mechanism on suicide inactivation via oxoiron(IV) intermediate deserves further investigation, at least for CPO catalyzed epoxidation of allylbenzene.

##### 11:00 MOLECULAR-LEVEL MIXING OF NOVEL POLYMER NANOBLENDS

Joshua U. Otaigbe, Eric Taylor, Dave Rhoades, and Denise Beitia\*, University of Southern Mississippi, Hattiesburg, MS 39406

Molecular-level mixing of reactive polymers is an economic technique use to produce new polymers with enhanced properties and particular structures. A novel method was employed to prepare nanostructured blends (nanoblends) of polypropylene (PP)/Polyamide 6 (PA6) and polypropylene (PP)/Polycarbonate (PC) using a Thermo Haake polydrive batch mixer. This research presents the system utilized to compatibilized PP/PA6 and PP/PC blends at different weight percents via in situ polymerization and in situ compatibilization. The PA6 and PC were synthesized via ring opening polymerization of  $\epsilon$ -caprolactam (monomer of polyamide 6) and cyclic carbonate respectively. The torque measurements of the polydrive revealed that compatibilization took place in the reaction of the materials generating grafting polymers. The melting and crystallization rates of the PP/PA6 blend and the thermodynamic stability behavior of the PP/PC blend were studied using differential scanning calorimeter (DSC). This analysis determined that PP/PC blend crystallize fast a low temperature and PP/PA6 indicative that the level of compatibilization affects crystallization kinetics. The dynamic mechanical properties and thermomechanical behavior of these blends were accomplished by standard dynamic mechanical analysis (DMA). This study is able to indicate compatibilization on these blends leading to the improved of mechanical properties and the preparation of nanoscale polymer blends.

##### 11:15 SYNTHESIS OF NOVEL STIMULI-RESPONSIVE, WATER-SOLUBLE NORBORNENE BASED MONOMERS FOR RING OPENING METATHESIS POLYMERIZATION

David Rankin\* and Andrew B. Lowe, University of Southern Mississippi, Hattiesburg, MS 39406

Ring Opening Metathesis Polymerization (ROMP) is a variation of olefin metathesis in which the metal-catalyzed redistribution of carbon-carbon double bonds of strained cyclic alkenes leads to a ring-opened unsaturated polymer. The synthesis of norbornene-based monomers for ROMP is described. The monomers described are new functional, stimuli-responsive, water-soluble norbornene derivatives. The

tertiary amine, 4-(2-dimethylaminoethyl)-4-azatri-cyclo[5.2.1.0]dec-8-ene-3,5-dione (DMAEATDD), is readily prepared from the reaction of N,N-dimethylethylenediamine with 4-oxa-tricyclo[5.2.1.0]dec-8-ene-3,5-dione. This monomer is particularly useful as a precursor to many novel stimuli-responsive cationic and zwitterionic monomers. We have derivatized DMAEATDD with both benzyl chloride and 1,3-propanesultone to yield the corresponding cationic and sulfopropylbetaine derivatives for aqueous ROMP. We have also started the synthesis of novel water-soluble Ru-alkylidene complexes, which will be used for the synthesis of novel stimuli-responsive polymers via ROMP.

### ECOLOGY AND EVOLUTIONARY BIOLOGY

Chair: Clifford Ochs, University of Mississippi

Vice-chair: David Beckett, University of Southern Mississippi

## FRIDAY MORNING

### Atlantic

8:50 Introduction  
Clifford Ochs, University of Mississippi

9:00 DETERMINING ORIGINS OF THE DISJUNCT POPULATIONS OF SOUTHERN REDBELLY DACE IN WESTERN MISSISSIPPI USING MOLECULAR DATA

Brian R. Kreiser\* and William T. Slack, University of Southern Mississippi, Hattiesburg, MS 39406, and Mississippi Museum of Natural Science, Jackson, MS 39202

Southern redbelly dace (*Phoxinus erythrogaster*), despite their name, are most abundant from Minnesota to New York and southwards to the Central Highlands. Disjunct populations are found to the west in Colorado, New Mexico, Kansas, Oklahoma and Arkansas and to the south in Mississippi. In Mississippi, disjunct populations are located in the western portion of the state in the Yazoo River drainage as well as in the southwest part of the state (Clark Creek). The goal of this project was to characterize the population genetic structure of *P. erythrogaster* in western Mississippi in order to test biogeographic hypotheses and to assess the extent of genetic differentiation among populations. We sequenced a portion of the mitochondrial ND5 gene for representatives from Mississippi as well as for individuals from populations across the range. The western Mississippi populations were found to represent two distinct clades with populations from the Yazoo drainage in one clade and the population from Clark Creek in the other. The close relationship between the Ozarks and western Mississippi populations suggests an origin by move-

ment down the Mississippi River rather than dispersal through a historic connection with the Tennessee River.

9:15 COMPLETE MITOCHONDRIAL DNA SEQUENCE OF THE CYTOCHROME C OXIDASE SUBUNIT I (COI) FROM THE BLUE CRAB (*CALLINECTES SAPIDUS*)

Richard Darden\* and Brian R. Kreiser, University of Southern Mississippi, Hattiesburg, MS 39406

The complete sequence of the blue crab, *Callinectes sapidus*, mitochondrial cytochrome c oxidase subunit 1 (COI) gene has been identified. The 1,533 nucleotide sequence codes for a 511 amino acid peptide. The CsapCOI is A + T rich (61.99%) and the codon usage is highly biased toward a preference for A- or T-ending triplets. The *C. sapidus* COI amino acid sequence shows high homology with several other crustacean sequences and phylogenetic analysis indicates that the *C. sapidus* sequence is closely related to *C. similis* and *C. exasperatus*. Comparisons of the nucleotide sequence for *C. sapidus* individuals from the Atlantic and Gulf coasts of North America revealed single nucleotide polymorphisms (SNPs), with 33 nucleotide sites showing SNPs between individuals. Most variation, 21 nucleotide sites, occurred within a 700 bp portion at the 5' end of the sequence. With only two exceptions, all SNPs occurred as synonymous transitions such that the peptide sequence is conserved among *C. sapidus* individuals.

9:30 AN INVESTIGATION OF NUTRIENT LOADING ON ALGAL GROWTH IN A MISSISSIPPI FARM POND

Kevin H. Wyatt\* and George F. Pessoney, University of Southern Mississippi, Hattiesburg, MS 39406

Twelve clear-plastic boxes were suspended in a farm pond to determine the effects of nutrient loading on algal growth. Each box was filled with 12 l of water and 1 in (5 lb) of sediment from the pond. The boxes were attached to a Styrofoam flotation device and suspended inside a floating chlorinated polyvinyl chloride (CPVC) frame. The frame was anchored in 4 ft of water and allowed to move 360 degrees within the pond. Phosphorus ( $K_2HPO_4$ ), Lime ( $CaCO_3$ ) and a suspension of *Lemna* were then added in various concentrations to each experimental box. Two boxes served as a control and contained only pond water and sediment. After a ten-week period, samples were collected from each container to determine treatment effects. Biomass was quantified as dry weight (DW) and algae were identified to genera. The data revealed that lime substantially increased biomass, whereas phosphate did not. *Lemna* did not have an apparent allelopathic effect on algal growth. Algal genera *Spirogyra* and *Oedogonium* dominated all containers. An additional ten-week experiment is in progress and additional results will be discussed.

9:45 COMPARATIVE POPULATION DYNAMICS OF *PERIDINIUM* (DINOPHYCEAE) SPECIES IN A NORTHERN MISSISSIPPI LAKE

Andy Canion\* and Clifford Ochs, University of Mississippi, University, MS 38677

The temporal and spatial variations of four species of the freshwater dinoflagellate genus *Peridinium* were measured in a small lake in northern Mississippi (Boondoggle Lake) over a period of 16 months. Water samples were taken from depths of 0.25 m, 1 m, and 2 m (anoxic during summer) on each sampling date. Environmental factors measured included pH, temperature, dissolved oxygen, nutrient concentrations and turbidity. Dinoflagellates were enumerated using light microscopy and species confirmed by SEM, according to the conventional taxonomic method of thecal plate pattern comparison. There were varied temporal patterns of maximum population density for each species. Population data were also examined with respect to the measured environmental factors to determine correlative relationships between the abiotic environment and population density. The results obtained suggest a seasonal succession of the different *Peridinium* species due to seasonal environmental change, competition, or a combination of these variables.

10:00 Divisional Poster Session

TREE-ROOSTS OF *CORYNORHINUS RAFINESQUII*, RA-FINESQUE'S BIG-EARED BAT, IN SOUTHERN MISSISSIPPI

Austin W. Trousdale\* and David C. Beckett, University of Southern Mississippi, Hattiesburg, MS 39406

Most ecological studies of *Corynorhinus rafinesquii* have been based on populations that primarily used caves or manmade structures (e.g., abandoned buildings) as roosts. However, this species also utilizes cavities of trees, which are thought to be the historical day-roosts of *C. rafinesquii* in the Gulf Coastal Plain. Previous studies suggest that tree cavities have a finite "lifespan" as suitable roosts for bats and are generally restricted in distribution. Because knowledge of tree use by *C. rafinesquii*, a species of concern throughout its range, was scanty, the goals of this study were to identify and describe treeroosts of *C. rafinesquii* in DeSoto National Forest, Mississippi. Using radiotelemetry to locate trees used by bats that we captured, we characterized roosts using both qualitative and quantitative variables specific to the individual tree and to its surrounding habitat. Of twelve tree-roosts that we located, eight were *Nyssa* sp. and four were *Magnolia grandiflora*. Roost trees were relatively large (mean DBH = 78 cm), nine were alive, and most possessed "trunk hollows" rather than basal openings. Most trees were located < 20 m from a stream; five trees were located directly beside the main channel. Five trees were used by multiple radiotagged individuals. Short-term roost fidelity (measured in days) was generally low, but several bats returned to the same tree multiple times during the session that

they were monitored. Some trees were also re-used by *C. rafinesquii* over a number of years.

Divisional Talks

10:15 MULTIPLE INTERACTION EFFECTS OF PHYSICAL, CHEMICAL, AND BIOLOGICAL FACTORS ON PHYTOPLANKTON PRODUCTIVITY IN MODEL WETLANDS

F.E. Ogbebo, Clifford Ochs\*, C.A. Britson, and S.T. Threlkeld, University of Mississippi, University, MS 38677

The effects of solar UV, agrichemicals, nutrient loading, turbidity, and fish on algal primary productivity were examined in a seven-week experiment of factorial design in 500-L outdoor mesocosms during summer, 2000. There was a main UV effect on primary productivity on three of the four days of sampling. We found several UV-related two-way interaction effects. We assessed UV exposure in the mesocosms using a DNA repair-deficient strain of *Escherichia coli*. This biological dosimeter is designed for use in aquatic environments to evaluate UV penetration in water. We found a strong correlation between UV levels and percent survival of dosimeter cells from the two different water depths. With possible continued increases of UV radiation in temperate regions due to ozone depletion, an increased understanding of the interaction of UV and multiple stressors in freshwater ecosystems constitutes a timely and important problem.

10:30 RECRUITMENT OF THE PUBLIC FOR A SURVEY OF THE DISTRIBUTION OF THE GREEN CUBAN BANANA ROACH (*PANCHLORA NIVEA*) IN MISSISSIPPI

John D. Davis\* and Scott Peyton, Mississippi Museum of Natural Science, Jackson MS 39202

The Mississippi Museum of Natural Science has recruited the public in studying the distribution of *Panchlora nivea* in this state. This tropical roach became established in Florida in the 1970s and has colonies in Texas. Seven Mississippi records for *P. nivea* have been published, mostly from coastal areas. On July 28 a gravid female was brought to the MMNS from Pearl Mississippi, Rankin County, first recorded from the Jackson area. This offered an opportunity to determine how effective the public might be in surveying the distribution of an easily recognized insect. On September 2 a description and the MMNS address were placed in the statewide Clarion Ledger. A Jackson television newscast, a college and alternative newspaper and an internet "blog" also gave this information. Citizens brought specimens from rural Walthal County (Sept. 5), Laurel in Jones County (Sept. 6), and South Jackson in Hinds County (Sept. 12). There are no published records from these locations. A total of seven contacts was made, of which three were katydids and stinkbugs. Four were from women and three from men. None of the respondents was under 25. At a meeting of primary and secondary teachers at

MMNS, 27 of 56 (48%) stated that they had been made aware of the roach hunt by the media.

#### 10:45 ANALYSIS OF FRESHWATER SAND-DWELLING CHIRONOMID LARVAE IN DISTURBED AND RELATIVELY UNDISTURBED BLACKWATER STREAMS

Robert C. Fitch\* and David C. Beckett, University of Southern Mississippi, Hattiesburg, MS 39406

Freshwater sand-dwelling chironomid larvae were studied in the summer of 2002 in six blackwater streams in Southern Mississippi. Three of the streams were in relatively undisturbed habitats and the other three streams were in disturbed habitats affected by either non-point source pollution, point source pollution, or both. Sand core samples were taken randomly within three sites per stream (five samples per site; fifteen samples total per stream), and chironomid larvae were identified to the lowest possible taxon. *Rheosmittia* sp. composed 20–80% of the larval chironomid population in the undisturbed streams, whereas the three disturbed streams had three different dominant taxa (i.e., *Polypedilum scalaenum* group, *Tanytarsus* sp. P, and *Dicrotendipes* sp.) and low percentages of *Rheosmittia* sp. Taxon richness, total number of organisms, and species diversities were variable among the streams. However, polar ordination based on percentage similarity showed that the three disturbed streams clustered together. The three relatively undisturbed streams also formed a cluster distant from that of the disturbed streams. This study may indicate that *Rheosmittia* dominates sandy substrates in blackwater streams that are relatively unpolluted. Furthermore, freshwater sand-dwelling chironomids may serve as indicators of ecological disturbance.

#### 11:00 THE HISTORY OF ALABAMA SHAD ITS LIFE STAGES WITHIN THE PASCAGOULA BASIN

Paul Mickle\* and Brian R. Kreiser, University of Southern Mississippi, Hattiesburg, MS 39406

Information about the history of the Alabama Shad, *Alosa alabamae*, and its presence along the Gulf coast is limited. Although the species is not listed as threatened or endangered, declines in populations have raised concerns and projects are currently underway to conduct stock assessments within the rivers that they reproduce in. The Pascagoula drainage is unique in that it is the only undamed major waterway in the lower forty eight states. Within my beginning field season, the first year Alabama Shad have been caught in summer holding areas. The type of habitat that the fish appear to be using is a combination of heavy current and a clear current break that has a defined edge. The spawning grounds have not yet been documented but several sites are labeled as candidates. Adults are caught entering the river January through March on their way to the spawning grounds. Understanding the life stages of the Alabama Shad and its habitat in the river will provide crucial information toward conservation.

11:15 Break

#### 11:30 PRELIMINARY REPORT ON DETERMINING RANGE WIDE STOCK STRUCTURE IN THE ALABAMA SHAD, *ALOSA ALABAMAE*, (JORDAN & EVERMANN 1896): CONSERVATION AND MANAGEMENT IMPLICATIONS FOR AN ANADROMOUS SPECIES

Bryant R. Bowen\*, Brian R. Kreiser, and Stephen T. Ross, University of Southern Mississippi, Hattiesburg, MS 39406

Anthropogenic affects on the environment have caused population declines for many species and here in Mississippi we have anadromous fish populations that are suffering from these effects. Some of these impacts include, but are not limited to, eutrophication, nonnutrient loading, overfishing, exotic species invasions, loss of essential habitat, and the degradation of the watershed. The goal of my research is to use mitochondrial DNA (mtDNA) and microsatellite markers to determine the phylogeographic relationships among Alabama shad populations, thus determining if drainage specific stocks exist. Genetic techniques have proven to be a useful tool in conservation biology by delimiting stock structure in other anadromous species such as salmon and sturgeon, as well as the closely related American shad (*A. sapidissima*). One aspect of my project is to assess stock structure through sequencing and restriction fragment length polymorphisms of mtDNA. The second part of my project is to employ microsatellite markers. Based on the literature, five regions of the mitochondrial genome have been targeted: the cytochrome b gene, control region (D-Loop), NADH dehydrogenase 5 and cytochrome oxidase I (COI). Of these we have successfully amplified and sequenced portions of the cytochrome b gene and the D-Loop region. For the microsatellite analyses we have established that published primers for *A. sapidissima* work well for *A. alabamae*. Understanding the structure of populations of *A. alabamae* will help identify unique diverse populations for management concerns and help estimate the health of populations and ecosystems that this species inhabits.

#### 11:45 SIZE-CLASS DISTRIBUTION OF NORTHERN DIAMONDBACK TERRAPINS (*MALACLEMYS TERRAPIN TERRAPIN*) WITHIN A NORTH EAST ATLANTIC SALT MARSH ESTUARY

Thomas Mohrman\* and Roger C. Wood, University of Southern Mississippi, Hattiesburg, MS 39406, and Richard Stockton College of New Jersey

The diamondback terrapin, *Malaclemys terrapin*, has a geographic range confined to salt marshes extending along the Atlantic and Gulf coasts of the United States. Unfortunately, little is known about the distribution or other aspects of the biology of juvenile terrapins in any portion of their range. In August and September, 2002, field work on a population of northern diamondback terrapins (*Malaclemys terrapin terrapin*) from the Cape May Peninsula of southernmost New Jersey

resulted in the discovery of a small creek heavily used by juvenile terrapins. Sampling in this creek resulted in the capture of 64 individuals, all juveniles with the exception of one adult female. Similar sampling efforts in an adjacent creek resulted in a population representing all growth stages (juveniles, subadults, and adults). Reasons for the differing population characteristics in these superficially similar, adjacent creeks are unclear. Further fieldwork is required to determine whether creeks inhabited only by juveniles are a typical characteristic of diamondback terrapin populations.

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## FRIDAY AFTERNOON

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### Atlantic

#### 1:15 GOPHER TORTOISE HATCHING SUCCESS IN SOUTHERN MISSISSIPPI

Krista Noel\*, and Carl Qualls, University of Southern Mississippi, Hattiesburg, MS 39406

This study focuses on hatching success in DeSoto National Forest, one of the gopher tortoises' last strongholds in the western portion of its range. Previous studies have found low recruitment here, largely due to low hatching success of tortoise eggs. This ongoing study seeks to determine the causes of this low hatching success. In 2002 and 2003, hatching success was compared between eggs that were artificially incubated and incubated under natural conditions. Hatching success for eggs incubated under favorable conditions in the laboratory was ~60% in 2002 and 2003, compared to hatching success of 6% (2002) and 16.5% (2003) for eggs that remained in natural nests. This suggests that, as many as 40% of the eggs had intrinsic problems, while 60% were capable of successful development. However, hatching success was much lower in nests, suggesting that something about the nest environments was unsuitable for successful hatching. In addition to monitoring hatching success in natural nests, several aspects of the nest environment were quantified (including nest location and orientation, tree canopy cover, depth of eggs, soil type, ground cover vegetation, nest temperature, and rainfall), to search for environmental factors that are correlated with hatching success. No single factor appears to be responsible for the failure of eggs to hatch in nests, but nest temperature multivariate analysis suggests that nest temperature, egg depth, soil composition, and vegetation cover may all play a role.

#### 1:30 DIFFERENCES IN TEMPORAL PATTERNING OF MALE COURTSHIP FIND ACTION BEHAVIORS BED AND WITHIN SYMPATRIC POPULATIONS OF THE SALTICID JUMPING SPIDERS *ZYGOBALLUS RUFIPES* AND *ZYGOBALLUS NERVOSUS*

John D. Davis, 1718 Hillview Drive, Jackson MS 39211

*Zygoballus rufipes* and *Z. nervosus* are closely related spiders with complex visual courtship displays typical of salticids. Such displays presumably act as isolating mechanisms

as well as sexual signals. Four male *Z. rufipes* and four male *Z. nervosus* were taken from sympatric populations at the same time. Courtship responses to females were recorded on 16 mm film at 48 frames per second. Analysis was made with a frame counting projector. A "unit" of the display was defined as the interval from legs 1 being raised fully to return to this raised position. Such units are repeated after courtship begins until the male reaches the female. In *Z. rufipes* first legs are raised 90 degrees; in *Z. nervosus* 60 degrees. *Zygoballus rufipes* brings tips of the legs together in the next movement while *Z. nervosus* moves them apart. *Zygoballus rufipes* makes a direct approach; *Z. nervosus* "sidles" 10 units from the same distance from the female were timed for both species. *Zygoballus rufipes* averaged 0.60 seconds/unit with individuals averaging from 0.33 to 1.14 seconds. *Zygoballus nervosus* averaged 0.93 seconds with individuals averaging from 0.72 to 1.18 seconds. Courtship displays therefore varied between species in posture, approach, and timing. Within species, there was little variation in posture and approach, but considerable variation in timing. Possible significance of these displays as isolating mechanisms will be discussed.

#### 1:45 ECOLOGICAL FOOTPRINT OF JACKSON STATE UNIVERSITY

Cristina C. Nica\*, Elgenaid Hamadain, and Pao-Chiang Yuan, Jackson State University, Jackson, MS 39217

There is little doubt regarding the importance of understanding the effect of human influence on ecosystems. According to the scientific literature, we consume over 40 percent of the net primary productivity on Earth each year. Despite the fact that human influence is arguably the most important factor affecting life of all kinds in today's world, the environmental problems are, in most cases, difficult to be assess. The Ecological Footprint (EF), a notion first introduced in 1996 by Martens, is a tool that helps people assess more clearly the effect of human activity on the planet and what can be done about it. Communities, nongovernmental organizations, business and governments can use Ecological Footprint assessments to create strategies for a sustainable development. The purpose of this paper is twofold: First, to assess the Ecological Footprint for Jackson State University, the urban university of Mississippi; and secondly, to predict the impact of a new administrative policy at a medium sized university; i.e., denying freshmen and sophomores the privilege of bringing cars to campus. Using the EF of the University, it was demonstrated that there is a significant difference in the environmental impact due to reducing car traffic on campus. The data were collected based on surveys and university statistics and processed using "Redefining Progress Organization" and CampCalc software for calculating the EF. The paper also makes use of GIS techniques for mapping and SAS software for statistical calculation. The paper will demonstrate the importance of using EF to plan for future campus development and create an urban campus that is aesthetically and

ecologically balanced.

## 2:00 AN UPDATE OF THE CHECKLIST OF MYXOMYCETES IN MISSISSIPPI

Katie Winsett\* and Lucile McCook, University of Mississippi, University, MS 38677

Myxomycetes, or slime molds, are small, eukaryotic organisms that are now classified in the Kingdom Protista. The Pullen Herbarium (MISS) at the University of Mississippi has a collection of approximately 2000 specimens from every region of the state that were collected by Dr. Donald Russell. This collection was previously used to prepare the Checklist of Myxomycetes from Mississippi in 1968. The specimens were databased and the checklist was updated using the literature, other collections, and the collection at the Pullen Herbarium. County level distribution maps for myxomycete species were produced and GIS technology was used to investigate spatial patterns of distribution for these organisms. This information was compared to ecological data for the areas to determine if the known distributions are due to collection bias or differences in the habitats sampled.

2:15 Divisional Business Meeting

### GEOLOGY AND GEOGRAPHY

Chair: Jack Moody, Mississippi Office of Geology  
Vice-chair: Stan Galicki, Millsaps College

## FRIDAY MORNING

Pacific

8:45 Divisional Poster Session

## FORAMINIFER AND ARCELLACEAN ASSEMBLAGES OF MISSISSIPPI AND LOUISIANA MARSHES APPLIED TO THE HOLOCENE PEARL RIVER DELTA

Charlotte A. Brunner\*, Marco J. Giardino, and Ervin G. Otvos, University of Southern Mississippi, Stennis Space Center, MS 39529; NASA, Stennis Space Center, MS 39529; and University of Southern Mississippi, Ocean Springs, MS 39566

Trends in surficial foraminifer and arcellacean assemblages are related to the environment of low-lying, microtidal marshes of coastal Mississippi and Louisiana in order to interpret paleoenvironment of late Holocene marsh sections from the region. Five locales were selected along a salinity gradient from 2 to 25 psu in the Mississippi Sound and Pearl River delta. At each locale, five samples of the top 10 cm were taken from the subtidal channel, unvegetated low-intertidal zone, the grassy marsh border, levee crest, and marsh interior. Samples were split by settling to >300 foraminifers,

and a census was made of all foraminifers and arcellaceans >45  $\mu$ m. Assemblages vary with both salinity and subenvironment-elevation. The high-salinity locales are dominated by *Ammonium* spp. and *Miliammina fusca* and are similar to those of many meso- to polyhaline, clastic marshes of the northern Gulf of Mexico. In contrast, the low-salinity locales host abundant arcellaceans with common *Trochammina irregularis* and *Tr. salsa*. The unusual assemblage resembles those reported from oligohaline, upper marshes of a handful of locales in the world. Based on analogy with surface samples, assemblages from a vibracore from the lower Pearl River marsh show a clear succession from estuary to channel, followed by mesohaline lower marsh. The section is capped by the *Trochammina* assemblage starting at about 1500 yBP, which appears to coincide with a drastic local decrease in native American residents in the delta.

## Divisional Talks

## 9:00 WILLIAM DUNBAR AND THE EXPLORATION OF THE SOUTHERN PART OF THE LOUISIANA PURCHASE

Michael B.E. Bograd, Mississippi Office of Geology, Jackson, MS 39289

Two hundred years ago, President Thomas Jefferson was organizing surveying and scientific expeditions to send into the newly acquired Louisiana Purchase. The story of the Lewis and Clark expedition in the north is well known. The exploration of the southern part of the Louisiana Purchase is not as well known. President Jefferson asked his correspondent William Dunbar (1749–1810) of Natchez to assist in planning the exploration of the Red and Arkansas rivers. Dunbar, a native of Scotland, had become a successful planter in the Natchez District and was interested in science and natural history. Planning difficulties included finding a suitable officer with surveying skills as leader, enlisting a scientist, concerns about Spanish troops under orders to stop Americans, and concerns about hostile Indians. The expedition was to acquire information about terrain, geography, soils, mineral resources, plants with medicinal properties, and the animal kingdom “from the mammoth down to the field mouse.” Due to delays in starting the main expedition, Dunbar and naturalist George Hunter departed in October 1804 on a 3-month trip up the Ouachita River and to the hot springs (in what is now Arkansas). They made scientific observations of the flora and fauna, mineral resources, and the hot springs. The main Red River expedition did not depart until 1806, with Thomas Freeman and Peter Custis as scientists, and was only partially successful.



9:20 THE GOSPEL, THE SILURIAN, AND THE SLAVE  
TRADE: THE MURCHISON-LIVINGSTONE CON-  
NECTION

David T. Dockery III, Mississippi Office of Geology, Jackson,  
MS 39289

In the spring of 1865, Dr. David Livingstone was in need of a sponsor for his third missionary/expeditionary trip to Africa. Livingstone was not only a missionary and explorer but was also an experienced naturalist with an understanding of geology. On his first African tour, he was the first European to travel across the African Continent from the east coast to west coast and back again (in the years 1854–1856), and was honored in England as a national hero. At that time, Livingstone reported to Sir Roderick Murchison the occurrence of “strong beds of coal and iron-stone on the affluents of the Zambesi, and to the north-west of the Portuguese settlement of Tete.” This statement was published in Murchison’s third edition of *Siluria* (1859) with the conclusion that if Devonian and Carboniferous strata were present in Africa, the Silurian must be there as well. The Silurian System was not only described and named by Murchison (his greatest scientific achievement), but was promoted by him; he gratefully acknowledged those who found Silurian rocks in other lands. As president of the Royal Geographical Society in 1865, Murchison funded Livingstone’s third and last trip to Africa, a trip that focused the world’s attention on that continent and which helped fulfill Livingstone’s career-long wish of ending the Arab-Portuguese slave trade (as the British fleet did in 1870).

9:40 AN UPDATED GROUND WATER ASSESSMENT  
OF CAMP MCCAIN TRAINING SITE AND ENVI-  
RONS, GRENADA COUNTY, MISSISSIPPI

John McCarty\* and David M. Patrick, University of Southern  
Mississippi, Hattiesburg, MS 39406

Since the 1943 study of Camp McCain, both the size and objectives of the training site have enlarged significantly. There have been increased requirements to identify and protect natural resources, including shallow and deep groundwater. In the area of Camp McCain the shallow aquifers are protected from surface contamination by near-surface clay and shale layers. The principal aquifers in the area are in the Claiborne and Wilcox Groups. In the Claiborne the Tallahata Formation is a minor source of ground water. The basal member of the Tallahata Formation, the Meridian Sand Member, is in direct contact with the underlying upper Wilcox sands. The undifferentiated Meridian Sand – upper Wilcox sand is one of two primary aquifers in the area. The boundary between the two is difficult to determine with available electric logs and nearly impossible to distinguish using driller’s logs. The middle Wilcox sands of the Wilcox Group, although regionally a minor source of ground water, in the area of Camp McCain is one of the consistent aquifers. The other primary aquifer in the area of Camp McCain is the lower Wilcox sands. Below the Wilcox is the Midway Group, an aquiclude that also serves as the

basement for fresh water in this area. With Camp McCain converting to the City of Grenada water system in the early 1970s, the flow direction of the subsurface waters is now to the northwest, toward the large volume wells of the City of Grenada and the industrial water consumers south of the city.

10:00 LANDSCAPE EVOLUTION IN SOUTHEASTERN  
MISSISSIPPI: IMPLICATIONS FROM A QUATER-  
NARY SOIL CHRONOSEQUENCE

David Ufnar\*, Amy L. Seiter, and J. Heath Harwood, Univer-  
sity of Southern Mississippi, Hattiesburg, MS 39406

The soils of southeastern Mississippi are generally classified as Ultisols, and exhibit characteristics of extensive weathering such as: rubification, prominent illuvial clay accumulations, depletions in alkaline earth metals, and acidic pH values. These deeply weathered soils are restricted to the higher elevation interfluvies, and transition into less mature soils in the Quaternary terraces and alluvial soils of the valleys. The soils developed in recent (Holocene) alluvium are poorly developed and characterized by A/C horizonation. The terrace soils however, are in an intermediate stage of development, and the origin, development and age of these terraces is the focus of this study. A soil chronosequence based upon a transect near Estabuchie in Forrest Co., MS contains ridge soils with an Ap, E, Bw, Bs, Bts, Cox profile developed in sands and gravels of the Plio-Pleistocene Upland Complex. The profile is thick, with prominent structure, a thick argillic horizon (prominent clay coatings), reddening to 10R 4/8, and prominent sesquioxide coatings. The Quaternary terrace soils are poorly drained, and characterized by an Ap, Bw, Bg, Cg profile. This soil exhibits moderate development in medium-grained sands with some faint to distinct mottling, moderate illuvial clay accumulations, few concretions, and gleying in the lower portions of the profile. The age of the Quaternary terrace deposits is poorly constrained, and the sandy parent materials are easily eroded. Thus, it seems unlikely that these terraces formed prior to the last glacial sea-level lowstand. We hypothesize that the terraces developed during a slightly higher than present sea-level stand during the early Holocene.

10:20 Break

10:40 GEOLOGIC MAPS AND HIGHWAY CONSTRU-  
TION—THE HIGHWAY 76 BYPASS AT PON-  
TOTOC, MISSISSIPPI

David T. Dockery III, Mississippi Office of Geology, Jackson,  
MS 39289

Priddy (1943), in the Pontotoc County geology bulletin, placed the thickness of the upper Ripley sandstone, subsequently named the Chiwapa Sandstone, in Section 23, T. 9 S., R. 3 E. in Pontotoc County as 12.6 to 18.4 feet thick. Here, Priddy’s geologic map showed the upper Ripley to outcrop in the valley of Miller Creek below an elevation of about 450 feet above sea level. In the 2003 construction of the

Highway 76 Bypass at Pontotoc, Mississippi, the Chiwapa Sandstone was unanticipated. A supplemental rock removal estimate of \$360,000 was based on an average rock thickness of 6 feet over an area of 30,000 yards<sup>2</sup> for a total volume of 60,000 yards<sup>3</sup> at a cost of \$7.45 per yard<sup>3</sup>, less \$1.45 per yard<sup>3</sup> for the cost of unconsolidated soil removal. Soil borings showed the top of the sandstone to vary from 447.6 to 450.1 feet above sea level between stations 136 and 146 with an average elevation over the 1,000-foot interval of 448.5 feet. The actual volume of sandstone removed was 164,896 yards<sup>3</sup>, and the true cost of removal was \$7.45 per yard<sup>3</sup> for a total cost of \$1,228,475. This volume would have been used for highway fill if it were unconsolidated sand. The additional volume encountered indicated an average thickness of 16.5 feet, vindicating the original thickness reported by Priddy.

#### 11:00 IMAGE CREATION USING LIGHT DETECTION AND RANGING INTENSITY DATA: AN INTRODUCTION TO A NEW PRODUCT

Fazlay Faruque\*, Abu O.A. Khan, and Marcel Frigon, University of Mississippi Medical Center, Jackson, MS 39216; Jackson State University, Jackson, MS 39217; and Waggoner Engineering, Jackson, MS 39211

Light Detection And Ranging(LIDAR) is a relatively new airborne laser mapping technology. A typical LIDAR unit consists of a near-infrared laser system operating at a preset frequency, a Global Positioning System (GPS), and an Inertial Measurement Unit (IMU) for recording rotational angle. The post-processed final digital output consists of geo-referenced co-ordinates, and returned laser shots with elevation and intensity values. LIDAR applications focus primarily on creating Digital Elevation Models (DEM) and other topographic mapping products without using intensity values. The potential for using intensity data for image creation has yet to be fully explored. Intensity is a measure of the peak amplitude of return pulses reflected from the target. These values are relative and vary with data acquisition and target conditions, which makes feature extraction difficult. Although useful digital orthophotograph-type products or images have recently been created, commercial products are yet to emerge. This study focuses on studying the variables that impact the quality and reproducibility of LIDAR generated orthophotographs.

#### 11:20 A SEA FLOOR MONITORING STATION, NORTHERN GULF OF MEXICO

J.R. Woolsey\*, T.M. McGee, and C.B. Lutken, University of Mississippi, University, MS 38677

A Consortium designed to assemble leaders in gas hydrates research has been established at the University of Mississippi's Center for Marine Resources and Environmental Technology, CMRET. The primary objective of the group is to design and emplace a remote monitoring station on the sea floor in the northern Gulf of Mexico by the year 2005, in an area where gas hydrates are known to be present at, or just

below, the sea floor. This mission necessitates assembling a station that will monitor physical and chemical parameters of the sea water and sea floor sediments on a more-or-less continuous basis over an extended period of time. Development of the station allows for the possibility of expanding its capabilities to include biological monitoring, as a means of assessing environmental health. Establishment of the Consortium has already succeeded in fulfilling the critical need to coordinate activities, avoid redundancies and communicate effectively among researchers in this relatively new research arena. Complementary expertise, both scientific and technical, has been assembled to innovate research methods and construct necessary instrumentation. Advances, so far include new in-situ porewater sampling techniques, new seismic data-acquisition systems and processing techniques, progress on methane sensors, and a host of advances in geochemical analyses of gas hydrates, their formation, and their distribution in the Gulf of Mexico.

### FRIDAY AFTERNOON

Pacific

#### 1:30 A TECHNIQUE FOR DETERMINING POROSITY OF UNDISTURBED MARINE SEDIMENT

Conrad W. Curry<sup>1\*</sup>, Richard H. Bennett<sup>1</sup>, Matthew H. Hulbert<sup>2</sup>, Kenneth J. Curry<sup>3</sup>, and Richard W. Faas<sup>4</sup>, <sup>1</sup>SEAPROBE, Inc., Picayune, MS 39466; <sup>2</sup>Research Dynamics, West Chester, PA 19380; <sup>3</sup>University of Southern Mississippi, Hattiesburg, MS 39406; and <sup>4</sup>University of Southern Mississippi, Stennis Space Center, MS 39529

Porosity is a fundamental property of marine sediment to be measured from which wet bulk density can be easily determined and used in a variety of geoacoustic, geotechnical, and sedimentological studies, analyses, and models. However, methods of sampling marine sands suffer from the common problem of core disturbance making the in situ porosity difficult to obtain. Embedding the sediment within an epoxy resin matrix will minimize the disturbance to the microfabric and preserve the in situ sedimentary structure for subsequent study. Image analysis can then be used on thin sections to study the microfabric and porometry. A simple, accurate, and non-destructive technique is described for preparing and measuring the porosity of marine sediment (siliciclastic sand) that has been infiltrated with agar aboard ship immediately upon sample collection and later embedded in epoxy resin. The average porosity of 36 samples of marine sand collected offshore Fort Walton Beach, Florida and embedded with resin was determined to be 41.30%.

### 1:50 MISSISSIPPI COASTAL DATA NODE AND VALUE ADDED GIS DATA PRODUCTS

Keil Schmid\* and Barbara E. Yassin, Mississippi Office of Geology, Jackson, MS 39289

The Coastal Geology Section of the Mississippi Office of Geology has been actively involved in gathering and disseminating coastal data to interested users since it was formed in 1990. During the ensuing 13 years a large amount of data and local expertise has been developed. Concomitant to the data development, significant progress has been made in bringing Geographic Information System (GIS) technologies to the end user. GIS data and technologies are now staples for physical and biological scientists and have facilitated significant data sharing across disciplines. To expand use of the Coastal Geology Section's data inventory, an online data node has been developed to disseminate the collected data. As a key goal of the project is to share data across scientific boundaries, a composite product has been developed. It is a geospatial feature (coastline) with attributes that depict the natural features and historic evolution that defines its present character; it is, to a large degree, a presentation of the data and expertise gathered during 13 years of coastal research. To create this single feature with multiple attributes a systematic approach has been developed to conflate data from multiple sources and formats. The outcome is a product, with documentation on source data and methodology that can be used by a wide group of researchers and policy makers on federal, state and local levels.

### 2:10 MAKING HISTORIC MISSISSIPPI COASTAL T-SHEETS ACCESSIBLE ON THE INTERNET

Barbara E. Yassin\* and Keil Schmid, Mississippi Office of Geology, Jackson, MS 39289

The Mississippi Office of Geology received a grant from NOAA Coastal Services to make our Mississippi Coastal Data available on the Internet. A unique part of our collection are Mylar Coast and Geodetic Survey Topographic sheets from 1849 to 1920. At present no georectified T-sheets from this period are available and ready to use in a GIS mapping program. These valuable maps depict structures such as homes and piers, and natural features such as bluffs, beaches, and marshes. The T-sheets are beautifully hand drawn; they are a curiosity to the public and a scientific tool for the researcher. These maps have been used in tidelands court cases and are the best available data for depicting the shoreline character when Mississippi became a state in 1817. To make the maps available to the public, Mylar maps were scanned at 150 dpi, 8-bit gray scale. The Tif images were georectified in ArcMap using previously digitized shorelines in Mississippi Transverse Mercator projection and coordinate system. The resulting files were compressed using MrSid, and FGDC-compliant metadata was created for each image. Georectified map images will be available to the public in the summer of 2004 in many forms: (a) users can search for the data using keywords or location, (b) they can view the data with other layers in a GIS Internet Map

Server, or (c) they can download the files to their own PC.

### 2:30 Break

### 2:50 MISSISSIPPI MIOCENE OPAL

James E. Starnes<sup>1</sup>\*, D. Kenneth Davis<sup>1</sup>, and David Abbott<sup>2</sup>\*,

<sup>1</sup>Mississippi Office of Geology, Jackson, MS 39289, and

<sup>2</sup>Mississippi Department of Archives and History, Jackson, MS 39202

A newly described orthoquartzite-bearing exposure in the Miocene Upper Catahoula Formation of Claiborne County has yielded something rare and special to both Geologists and Archaeologists. At this exposure above a sandy-clay, which makes up the creek floor, is a two-foot-thick conglomeratic sandstone. The sand fraction includes medium to coarse-grained quartz and black chert sands with disseminated angular to sub-rounded black chert and quartz pea gravel in a matrix of vibrant multi-colored opalescent opal cement. Artifacts of opalescent and common orthoquartzite, as well as chert, were also associated with this outcrop. This discovery was the result of geologic surface mapping efforts by the Mississippi Office of Geology to better understand the geology and stratigraphy of the Miocene Aquifer system. The hydro-silica-rich Miocene deposits of the Catahoula Formation of Mississippi create interesting landforms and rock types that are petrologically different from other Tertiary units. Commonly, hard sandstones, as well as orthoquartzites, occur in the coarser grained lithologies as a near-surface diagenetic feature due to leaching of silica. Recent archaeological finds of both historic and aboriginal cultural artifacts have been found associated with these well lithified Miocene exposures. These finds include pre-historic quarry sites containing an orthoquartzite type new to archaeology, the remains of previously unrecorded pre-Civil War mill sites, and a culvert built of Miocene orthoquartzite on one of Mississippi's first railroads.

### 3:10 DISSOLVED TRACE ELEMENTS IN TWO CONTRASTING RIVERS SYSTEMS: THE MISSISSIPPI AND YUKON RIVERS

Alan Shiller, University of Southern Mississippi, Hattiesburg, MS 39406

We have been examining the temporal variability of dissolved and colloidal trace element chemistry in two contrasting major river systems: the Mississippi and Yukon Rivers. These two systems are similar in that they both have high suspended loads and moderately alkaline pHs. However, they differ greatly in climate and the extent of human engineering. In the lower Mississippi River, seasonal variability in many dissolved metals follows a seasonal "redox pump." This pump is caused by inputs from seasonally stratified lakes and reservoirs as well as by the temperature dependence of microbial manganese oxidation. In the Yukon River there is additionally evidence of a spring pulse of trace elements associated with early season soil flushing. The spring pulse has been

observed in certain headwaters of the Mississippi River system, so its absence in the lower river may reflect the effects of impoundments in damping out this signal. Thus, the timing of river delivery of some dissolved and colloidal materials to the coastal region is likely different in these two systems, reflecting both differences in hydrology and chemistry. We also observe greater amounts of colloidal Fe in the Yukon relative to the Mississippi which may reflect the greater DOC of the Yukon. This colloidal Fe could represent a significant pool of reactive Fe delivered to the coastal system. Finally, we note that permafrost-dominated basins in the Yukon system show relatively little concentration variability. Long-term changes in the seasonal concentration variability of such basins may thus provide an indicator of the effects of climate change on the landscape.

3:30 Divisional Business Meeting

### HEALTH SCIENCES

Chair: D. Olga McDaniel, University of Mississippi  
Medical Center

Vice-chair: Michelle Tucci, University of Mississippi  
Medical Center

## THURSDAY MORNING

Emerald

9:30 Welcome: D. Olga McDaniel, Chair of Health Sciences Division

### Mini-symposium—Selected Topics I

Moderator: L. Margaret Drake, University of Mississippi Medical Center

### 9:45 THE RISE OF HEALTHCARE INSTITUTIONS FOR SPECIFIC DISEASE IN MISSISSIPPI

L. Margaret Drake, University of Mississippi Medical Center, Jackson, MS 39216

In the 19<sup>th</sup> and early 20<sup>th</sup> century, healthcare institutions developed for citizens of Mississippi. The phenomenon of such institutions started in the Middle East. After the Crusades, Europeans adopted ideas about congregating people with the same disease together. Alms houses and pest houses were the first such European institutions followed by asylums for the mentally ill. Later sufferers of infectious diseases were similarly concentrated as the understanding of contagion arose. In the New World, mental health hospitals were the first large institutions to be built with the first in Virginia predating the Revolutionary War. In Mississippi, the Asylum for the Insane

predated the Civil War. The Sanatorium predated World War I. As the outskirts of the city of Jackson reached the borders of the Mississippi Asylum for the Insane in the 1930s, the government provided a more remote place for the mentally ill at Whitfield. In the 1940s the Rapid Treatment Center buses traveled to provide penicillin for syphilis sufferers. The Hill Burton Act PL79725, Hospital Survey and Construction Act of 1946 provided funds for hospitals which changed the way healthcare was delivered in the last half of the 20<sup>th</sup> century. Mississippi exemplifies society's response to healthcare. Citizens in the 19<sup>th</sup> and early 20<sup>th</sup> century were more willing to renounce their individual freedoms to a healthcare institution than after WWII. With more education through the GI Bill and more post secondary education after WWII, people claimed increasing decision making power in healthcare. Availability of more effective treatments also contributed to the demise of large state run institutions.

### 10:00 PHYSICAL THERAPY PIONEERS IN MISSISSIPPI – THE FOUNDING OF A PROFESSIONAL LEGACY

Cynthia Scott\*, Ruth M. Burgess, W.T. Johnson, J.H. Pierce, S.L. Scruggs, A.L. Stegall, and L.D. Welch, University of Mississippi Medical Center, Jackson, MS 39216

Background and Significance: The history of physical therapy in Mississippi is not well documented. Many of the pioneers of the profession are elders, increasing the urgency of gaining their perspectives of the profession. Purpose: The purpose of this presentation is to record the geographical distribution and personal accomplishments of 7 pioneers of physical therapy in Mississippi. Methods: An oral history methodology was used to interview 5 of the earliest Mississippi practitioners. The interview instrument was validated by two content experts familiar with the methodology as well as professional history. The sampling frame consisted of thirty three physical therapists who were the first licensees in the state. Five therapists were recruited from this list, each participating in an oral interview, which was transcribed verbatim. Transcripts were analyzed for common themes and elements. Two therapists who were deceased were also investigated through interviewing colleagues and searching archival materials. Data was triangulated with the archives of the Mississippi Physical Therapy Association (MPTA). Results: Major themes that emerged from interviews included arrival of personnel in the state, development of the MPTA. Discussion and Conclusions: This presentation focuses on one of the major themes, the early personnel, their entrance into the state, and the accomplishments of these pioneer physical therapists. The importance of the city of Vicksburg as a polio center, infantile paralysis foundation scholarships, and the individual characteristics and accomplishments of these individuals will be highlighted.

### 10:15 WOMEN'S TRUST OF THE HEALTHCARE SYSTEM

Amal Khoury, Nedra Lisovicz, Mandy Avis\*, and Deonna Allen, University of Southern Mississippi, Hattiesburg, MS 39406

**Objective:** People's trust of the healthcare system affects their use of services and, therefore, their health outcomes. There is concern that some Mississippians underutilize healthcare services because of their mistrust of the healthcare system. This study examined the level of Mississippians' trust of healthcare providers and perceptions of racism within the healthcare system. **Method:** A statewide telephone survey of a representative sample of women was conducted in the summer of 2003. We focused on women, because they make the healthcare decisions for their families. Respondents reported their use of specific healthcare services, beliefs regarding healthcare, and demographic characteristics. **Results:** 1054 women 40 years of age and older participated. More than half of the women had a high school degree or less; 69% were White, non-Hispanic, and 27% were African American. The analysis showed that 62% of women believed that rich people received better medical care than poor people, and 77% believed that health insurance affected the kind of care that a person received. Also, 44% agreed that hospitals sometimes do not tell patients the truth. Women's perceptions regarding racism in healthcare delivery were also assessed. **Data analysis** by subgroup of women is underway. **Conclusion:** A majority of women appeared to mistrust the healthcare system. To increase the appropriate use of healthcare services, providers, and policymakers should directly address women's beliefs.

### 10:30 PHYSICAL THERAPY PRACTITIONERS AND AN AGING POPULATION

Neva F. Greenwald, University of Mississippi Medical Center, Jackson, MS 39216

Within the last quarter of a century, the older segment of the US population has increased significantly. The changes in the composition of the population and public policy have resulted in alterations in educational and clinical practice for health care practitioners including physical therapy practitioners. This historical presentation identifies milestone events related to physical therapy services for older adults. The changes in practice and the various processes that physical therapy practitioners have taken to address this client/patient population over the past 25 years are discussed.

10:45 Break

Podium Presentation—Session I

Moderators: Ibrahim Farah and Walter Brehm, Jackson State University and Kessler Air Force Base

### 11:00 TREATMENT OF POSTMENOPAUSAL OSTEOPOROSIS IN SOUTH MISSISSIPPI

Tommy Winston\* and Benito Velasquez, University of Southern Mississippi, Hattiesburg, MS 39406

Osteoporosis is a serious and growing public health problem due to its association with skeletal fracture. Physical activity in the post-menopausal years has been recommended as a primary treatment strategy against osteoporosis and fractures. Both aerobic exercises and strength training provide the mechanical stimuli important for the maintenance and improvement of bone health. The purpose of this study was to determine the preferred method of rehabilitation used to treat postmenopausal osteoporotic women in south Mississippi. The study involved physical therapists, occupational therapists, kinesiotherapists, and athletic trainers from south Mississippi and compared the use of traditional aerobic exercise versus the more contemporary resistive-training method. A survey was developed by the researchers to determine which method each group of therapists preferred using in treatment of postmenopausal osteoporotic women. Criterion for participation was each therapist must treat at least five osteoporotic patients a year. Surveys were distributed via U.S. Mail. Data collected from completed surveys were analyzed using Student Sample Paired T-Test and Multivariate Analysis of Variance (MANOVA). Data analysis from both Student Paired Sample T-Test and Multivariate Analysis of Variance showed a statistically significant difference between the preferences of resistive-training exercise over aerobic exercise. In conclusion, therapists in south Mississippi preferred the use of resistive-training exercise as opposed to aerobic exercise in the treatment of postmenopausal osteoporosis.

### 11:10 ASSESSMENT AND SPATIAL DISTRIBUTION OF PESTICIDE USE, SOCIOECONOMIC STATUS, HEALTH CARE LEVEL AND DISPARITIES IN BREAST CANCER MORTALITY IN MISSISSIPPI

Ibrahim Farah\* and Mohamed H. Abdalla, Jackson State University, Jackson, MS 39217

A combination of risk factors makes Mississippi suitable for studying the pathways of breast cancer etiology. The purpose of this study was to analyze pesticide exposure and the risk of breast cancer mortality. Data for this study consisted of secondary analyses of the Mississippi age-adjusted breast cancer mortality aggregated by two periods (1970–1994 & 1996–1999). Statistically significant linear associations were found between level of pesticide exposure (acres planted/crop) and breast cancer mortality rate in Mississippi women per state economic area (SEA.) For the 1970–1994 period, significant associations ( $p < 0.05$ ) using Pearson correlation analysis ( $r$ ) were found for the rice crop with white females at Greenville SEA ( $r = 0.88819$ ) and black females at the same SEA ( $r = 0.67844$ ); the soy crop at Hattiesburg SEA for black females ( $r = 0.72034$ ) and at the same SEA for black females with wheat ( $r = 0.57018$ ); for the catfish crop, a significant correlation was found for white females in Yazoo ( $r = 0.59200$ ) and black females in Columbus SEA ( $r = 0.70945$ ). For the 1996–1999

period, there were significant findings ( $p < 0.05$ ) for the black females with cotton in Meridian SEA ( $r = 0.41878$ ) and black females with rice in Greenville SEA ( $r = 0.63370$ ). A positive significant association was found for white females with soy crop in Columbus SEA ( $r = 0.79209$ ) and with black females in Yazoo SEA ( $r = 0.50667$ ). In comparing the two periods of study, black females and white females showed different frequencies of positive and significant correlations.

#### 11:20 A LINGUISTIC ANALYSIS OF PATIENT/PHYSICIAN COMMUNICATION AND ITS EFFECTS ON PATIENT HEALTH AND TREATMENT OUTCOMES

Derrick Spires\* and Elizabeth Heitman, Tougaloo College, Tougaloo, MS 39174, and Vanderbilt University, Nashville, TN

This observational study is intended to identify and analyze specific linguistic aspects of patient/physician communication and to explore what implications they present for the patient/physician relationship. The linguist aspects include the use of paralinguistic, the use of the indirect passive voice by physicians, the use of "dehumanizing" language when talking about patients, the effects of cultural perception on language use, and methods of improving patient/physician communication. The methods of this study include interviewing physicians and patients, a review of medical literature in order to assess how physician talk about and to patients, observing hospital culture and power structures and observing patient/physician, physician/physician, and patient/patient interactions, listening for linguistic cues and indicators of person perceptions and attitudes. Preliminary results have shown that while physicians believe that empathy is a key component in patient/physician communication, they frequently use dehumanizing terms such as "case" and indirect passive phrases such as: "the patient was diagnosed with..." in their everyday discourse. There also appears to be a hierarchical power structure that is shown in language. A positive correlation between extended conversations between patients and physicians before and after surgery and case outcomes may also exist. Additionally, as Mississippi's immigrant population continues to grow and there continues to be a visible social separation along racial, class, gender lines, cultural competence training is becoming as important to health care professionals' ability to serve the population as scientific competence.

#### 11:30 THE ROLE OF THE STATISTICIAN IN THE PROTECTION OF HUMAN RESEARCH SUBJECTS

Walter Brehm, U.S. Air Force, Keesler Air Force Base, Biloxi, MS

Clinical studies have been around as long as scientific medicine and the physician-investigators have always been bound by their Oath. Present concepts for the protection of research subjects are traditionally held to have begun with the

Nuremberg Code following the exposure of wartime atrocities committed in the name of medical research. The Declaration of Helsinki, the Belmont Report, and the Common Rule further refined these ideas. Although the Belmont reports distills the essence of human subjects protection down to two words and a sentence fragment, "Beneficence, Justice, and Respect for Persons," a whole industry, with its own literature, legends, and heroes, has grown up around the subject. The involvement of the statistician early in a study design will help meet all three requirements for the protection of the subjects. Respect for Persons is concerned mostly with informed consent and the statistician's role may be limited to presenting the existing data in an understandable way. The Justice requirement that benefits and burdens of research be distributed fairly is a sampling problem with statistical solutions. Beneficence demands that possible benefits of the study are reasonable compared to the risks. The statistician's role is to ensure that the study is properly designed to answer the question in a way that avoids undue risks to the subjects. Design considerations include collection of appropriate data, proper statistical tests, and adequate sample size.

### THURSDAY AFTERNOON

Emerald

1:00 Divisional Poster Presentation

#### I Disease Studies and Clinical Evaluations

#### THE EFFECTS OF STATIC STRETCHING AND VARIED LOCATION OF ULTRASOUND APPLICATION ON GAS-TROCNEMIUS FLEXIBILITY

William Woodall\*, Paula Stubbs, Jason Greer, Amanda Ehrhardt, Janet Greer, Robert Stallings, Brandi White, and Mark D. Weber, University of Mississippi Medical Center, Jackson, MS 39216

This study's purpose was to determine how the location of application of ultrasound impacts the gaining of muscle flexibility when static stretching is performed. Both legs of 20 subjects were used in the study. No subject had more than 20° of active dorsiflexion at their ankle. Each leg in the study was randomly assigned to one of three groups: (1) static stretch only, (2) ultrasound to muscle belly of gastroc, followed by static stretch, (3) ultrasound to Achilles tendon, followed by static stretch. The same examiner performed the measurement using the same specially designed measuring apparatus for accuracy. Using a repeated measures ANOVA it was found that dorsiflexion ROM improved significantly for both right ( $p < 0.001$ ) and left ankles ( $p < 0.001$ ) in all three groups over time. There was no difference between treatment groups ( $p = 0.8$  for left and  $p = 0.6$  for right) in relation to the amount of ROM gained. Much of the literature that reports changes in ROM measures following a program of heat and stretch has per-

formed the heat and stretch simultaneously. This is often not the strategy utilized in the clinic, where often the stretching is performed following heat application. While one study is not enough to call into question a generally accepted physical therapy intervention, it does suggest that continued research involving specific interventions should be continued in this area.

#### IT BAND Z-PLASTY FOR RECALTRICANT BURSITIS AND TENDONITIS

Phani Tumu, Audrey K. Tsao\*, and Charity Peacock, University of Mississippi Medical Center, Jackson, MS 39216

Trochanteric bursitis and IT tendinitis classically presents with tenderness over the greater trochanter and increased discomfort on active abduction and passive adduction. Patients typically have problems with walking long distances, climbing stairs, or simple weightbearing in extreme cases. Treatment is centered on physical therapy, use of ice, heat, ultrasound, NSAIDs, and steroid injections into the affected area. Effective non-operative treatment with this approach is better than 90%. A minority of patients are refractory and unable to tolerate the pain and limitations of this condition requiring surgical intervention. In this study, twelve patients (three males, nine females) refractory to non-operative care were identified. Each patient presented with increasing hip pain with a duration of months to years. Patients were treated with iliotibial band z-plasty for their refractory symptoms. The preoperative Harris Hip Score averaged 54.4 (range 31 to 73). Two out of twelve patients were lost to follow-up, leaving ten patients available for clinic or telephone follow-up. The average post-operative follow-up was 46.9 months (range 10 to 81). The average post-operative Harris Hip Score was 73 (range 54 to 96). The majority of patients were satisfied with the results of the procedure, and only one patient reported needing a cane post-operatively. One patient had continued pain post-operatively due to a subcutaneous hematoma at the incision site. Another patient had developed sciatica on the non-operative side approximately three years after the procedure. This patient had reported significant improvement in her operated hip up until the sciatica had developed. These two patients, however, were able to resume everyday activities. One patient had passed away as a result of a gastrointestinal pathology unrelated to surgery.

#### THE EFFECT OF VISION ON FUNCTIONAL REACH SCORES IN NORMAL YOUNG, NORMAL AND BALANCE IMPAIRED OLDER SUBJECTS

Min Huang<sup>1</sup>\*, Ruth M. Burgess<sup>1</sup>, Mark D. Weber<sup>1</sup>, Kimberly N. Shirley<sup>2</sup>, A. Ken Causey<sup>3</sup>, Stephanie R. Gorrell<sup>3</sup>, Kim L. Bartusek<sup>3</sup>, and Neva F. Greenwald<sup>1</sup>, <sup>1</sup>University of Mississippi Medical Center, Jackson, MS 39216; <sup>2</sup>Rehab Plus of Mississippi, Jackson, MS 39211; and <sup>3</sup>Mississippi Baptist Medical Center, Jackson, Clinton, MS 39056

The purpose of this study was to determine the effect

of altering vision on functional reach (FR) scores in normal young, normal and balance impaired older subjects. Subjects participating in the study were in two age group categories: The younger group was 20–35 years of age, and the older group was 60–80 years of age. For the study, subjects were divided into four groups: normal young (NY) (n = 61), normal non-retired old (NNRO) (n = 30), community retired old (CRO) (n = 30) and balanced impaired old (BIO) (n = 15). After being instructed, each subject performed FR under 2 different visual conditions: eyes open (EO) and vision blurred (VB). All data were analyzed using repeated ANOVA, and are expressed as mean  $\pm$  S.D. Alpha level of 0.05 was used to test for significance. The mean FR scores in NY group with EO and VB were 13.7 $\pm$ 2.7 and 13.0 $\pm$ 2.8 inches, respectively. The FR in NNRO group with EO and VB were 11.1 $\pm$ 2.3 and 10.3 $\pm$ 2.7 inches, respectively. The mean FR scores in CRO group were 8.9 $\pm$ 2.3 and 8.5 $\pm$ 2.9 inches, respectively. The mean FR scores in BIO group with EO and VB were 10.1 $\pm$ 2.8 and 9.7 $\pm$ 2.4 inches, respectively. Blurred vision significantly decreased FR scores in all groups ( $p < 0.01$ ). The FR scores between the groups were also significantly different ( $p < 0.01$ ). FR scores declined when vision was impaired and younger subjects performed better than older subjects did under either visual condition. There were no significant differences in FR scores between the subjects in CRO and BIO groups. These results suggest that FR test alone is inadequate to predict the severity of balance impairment in older subjects with visual impairment.

#### INTERFERENTIAL CURRENT AT ACUPUNCTURE POINTS FOR AN OLDER ADULT WITH KNEE PAIN: A CASE REPORT

Min Huang\*, Felix I. Adah, and Neva F. Greenwald, University of Mississippi Medical Center, Jackson, MS 39216

It has been demonstrated that acupuncture is an effective tool in the management of pain under a variety of conditions. The purpose of this case report is to describe the effectiveness of interferential current (IFC) at acupuncture points around the knee for chronic pain caused by osteoarthritis. The patient was a 92-year old woman who was blind. After receiving physical therapy in the hospital for 3 months following right total hip replacement (THR), the patient was able to ambulate 20 feet with a standard walker and moderate assistance. The patient was referred to a skilled nursing facility for further rehabilitation. Upon admission to the nursing home, the patient complained of her right knee collapsing during ambulation due to severe knee pain. To facilitate a decrease in pain, the patient received IFC stimulation with surface electrodes placed on acupuncture points around her right knee (eyes of knee, ST-34, and SP-10) plus ice 5 x/week for 8 weeks in addition to the standard physical therapy treatment interventions. At the end of 8 weeks, the patient subjectively rated pain 5/10 as compared to 10/10 initially. Functional Independence Measure (FIM) score in sit « stand, and wheelchair « bed transfer increased from 3 to 7 and ambulation distance in-

creased from 20 feet with moderate + 1 assist to 240 feet with standby + 1 assist. This case report shows that IFC stimulation at the acupuncture points around the knee may be an effective tool in reducing chronic knee pain and enhancing functional mobility for patients who have osteoarthritis.

#### HOMOCYSTEINE LEVELS AS AN INDICATOR FOR CVD: AGE AND GENDER DEPENDENCY AMONG MISSISSIPPI POPULATION

Olivia Rahaim Henry\*, Stacy Hull Vance, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Recently, homocysteine (HC) levels have shown to be an excellent biomarker for the development of cardiovascular disease (CVD). The specific objectives of this study were (i) to evaluate the age dependency of HC as a CVD marker, (ii) to study the gender prevalence in regard to HC levels, and (iii) to investigate the incidence of abnormal HC levels among random patients reported to the University of Mississippi Medical Center. A total of 95 volunteers (68 females, 27 males) were included in this investigation. The average ages of patients were  $41 \pm 16$  for females and  $40 \pm 15$  for males. Upon construction of database, the patients were subdivided into four categories ( $\leq 20$ , 21–40, 41–60, and  $\geq 61$ ) for each gender. The abnormal levels were recorded as low ( $< 5 \mu\text{M/L}$ ) or high ( $> 18 \mu\text{M/L}$ ). Data analysis was performed using standard computer software (Sigma Stat, Slide Write). The results obtained from this study suggest: (1) Regardless of gender, the HC levels were found to be directly proportional to age ( $7.53 \pm 2.18$ ,  $8.23 \pm 3.20$ ,  $10.00 \pm 1.87$ ,  $14.44 \pm 4.77 \mu\text{M/L}$  for females and  $8.53 \pm 3.26$ ,  $8.98 \pm 3.08$ ,  $10.52 \pm 2.56$ ,  $11.80 \pm 4.67 \mu\text{M/L}$  for males, (2) HC levels among the high risk population demonstrated a slight increase in the females ( $27.80 \pm 12.79 \mu\text{M/L}$ ) compared to the males ( $22.95 \pm 1.97 \mu\text{M/L}$ ). In conclusion, data obtained from this investigation provided the literature with more insights (age and gender dependency) regarding the use of HC as a diagnostic tool for CVD. \*Ph.D. Student, CHS Graduate Program, UMC

#### PERCEPTIONS OF THE QUALITY OF CARE PROVIDED BY ADVANCED PRACTICE NURSES IN AN ELEMENTARY SCHOOL-BASED HEALTH CENTER

Lisa A. Haynie\*, Anne A. Norwood, Kathryn Kolar, and Theresa M. Doddato, University of Mississippi School of Nursing, Jackson, MS 39216

Development and management of School Based Health Center (SBHC's) by advanced practice nurses provide a quality, cost-effective, and caring method of delivering primary health care services for young children within a school setting. The purpose of this study was to evaluate the perceptions of effectiveness of the SBHC and satisfaction of care that students received by teachers and parents. The concepts of interest for this study were parents' and teachers' perceptions of the effectiveness of a nurse-managed SBHC and the delivery

of care by advanced practice nurses, and their satisfaction with the services that the student(s) received. Data from the surveys were analyzed using descriptive statistics to obtain information on the impact of SBHC on parental work and student absenteeism, health care access for students, decreases in visits to other health care providers, and the use of emergency rooms. Findings: The majority of parental respondents gave permission for participation in the SBHC. More than one-half indicated that health care services that their child received at the SBHC were effective in decreasing the hours/days parents missed at work. A similar percentage responded that the number of emergency room visits decreased. Parents indicated satisfaction with the SBHC, as did the teachers in an overwhelming majority. Conclusions: Findings indicated that both parents and teachers were very satisfied with the care that had been provided for students and believed that the SBHC was effective in the services provided.

#### ENDODONTIC DIAGNOSTIC AND TREATMENT DATA FROM AN UNDERGRADUATE DENTAL SCHOOL CLINIC

J.C. Rutz\*, B.O. Gilbert, R.S. Gatewood, and C.F. Streckfus, University of Mississippi Medical Center, Jackson, MS 39216

The purpose of this study was to review data collected on endodontic patients at the University of Mississippi School of Dentistry. Methods: The following information was collected and summarized: (1) age, (2) sex, (3) tooth treated, (4) number of canals in tooth treated, (5) history of pain, (6) pre-operative pulpal and periapical diagnoses. All data were analyzed using a statistical SPSS software package. Results: (1) the most frequent age group was 40–49 (27.7%), (2) 61.1% were females; 38.9% males, (3) the most frequently treated tooth was the mandibular first molar, (4) analysis of number of canals revealed: 9.5% of mandibular incisors with 2 canals; 59% of maxillary second premolars with 2 canals; 47.8% of maxillary first molars with 4 canals; 34% of mandibular first molars with 4 canals, (5) sixty-five percent of patients reported prior incidence of pain, (6) the most frequent preoperative pulpal diagnoses were irreversible pulpitis (37.2%) and non-vital pulp (36.7%). The most frequent preoperative periapical diagnoses were normal apex (41%) and chronic apical periodontitis (23%). Conclusion: Analysis of the results of this project give valuable information as to the scope of endodontics practiced in this undergraduate endodontic clinic and help characterize clinical experiences available to the students.

#### BREAST CANCER CONTROL PRACTICES OF PRIMARY CARE PROVIDERS IN MISSISSIPPI

Amal Khoury, Nedra Lisovicz, Mandy Avis\*, and Deonna Allen, University of Southern Mississippi, Hattiesburg, MS 39406

Objective: Breast cancer is a leading cause of death in American women. However, many women in the Deep South do not participate in breast cancer screening and clinical trials.



Providers have a key role in educating and referring women. This study identified knowledge, attitudes, and practices of providers in the Deep South toward breast cancer screening and clinical trials. Method: Qualitative research was conducted in 2002 involving semi-structured interviews with 34 key primary care providers, including physicians and nurse practitioners, in the rural Mississippi Delta and urban areas of the state. The interviews were audiotaped, and the tapes were transcribed. Data analysis identified cross-cutting issues and themes. Results: Although providers were overall knowledgeable about breast health and concerned about the welfare of their patients, their implementation of breast cancer screening guidelines and knowledge of clinical trials, mammography costs, and programs that cover screening and treatment was limited. Providers faced barriers to referring women to screening and clinical trials, including time constraints, patient factors, and other issues. Conclusion: Providers participation in screening programs and clinical trials could be improved by: (1) educating providers about risk factors, screening guidelines, and programs such as the Breast and Cervical Cancer Early Detection Program, (2) instituting systems to monitor missed screening appointments, (3) addressing time barriers, and (4) addressing the fragmentation in women's health care.

**MOTOR FUNCTIONS BUT NOT ACQUISITION AND RETENTION OF ACTIVE AVOIDANCE RESPONSE ARE IMPAIRED IN METHYL PARATHION-TOLERANT RATS**  
Tingting Sun\*, Ian A. Paul, and Ing Kang Ho, University of Mississippi Medical Center, Jackson, MS 39216

Previous work showed that repeated exposure to methyl parathion (MP) caused prolonged inhibition of acetylcholinesterase (AChE) activity, and down-regulation of muscarinic receptor subtypes in the brain regions, including frontal cortex, striatum, hippocampus, and thalamus. In the present study, we found that these changes were not accompanied by changes in drinking and eating behaviors, but by delayed body weight gain and progressive deterioration of motor function. Further, the neurochemical changes did not cause impairment in the performance of acquisition and retention in active avoidance responding. Our studies indicate that prolonged inhibition of AChE activity and down-regulation of central nervous muscarinic receptors produces selective behavioral effects. Motor function appears more sensitive to the effects of chronic exposure to methyl parathion than learning and memory behavior. This is consistent with our previous finding that the most extensive down-regulation of muscarinic receptors was found in the striatum (~30%), the area believed to relate to motor function whereas hippocampus is relatively resistant to this adaptation mechanism (~10%).

**COMPARING INCIDENCES OF BREAST CANCER AND SURVIVAL RATES IN AFRICAN AMERICAN AND CAUCASIAN WOMEN**

Brittany Pinkney\* and Raymond Wynn, Mississippi Gulf Coast

Community College, Jackson County Campus, National Aeronautics and Space Administration, and the Singing River Oncology Center, Pascagoula, MS 39563

The purpose of this literature review is to further document the differences in survival rates of African American and Caucasian women with breast cancer. The incidence of breast cancer is lower among African American women, but African American women have a higher rate of breast cancer deaths than Caucasian women. Breast cancer is the leading cause of cancer death among African American women. In any one year, 95 out of every 100,000 African American women are diagnosed with breast cancer. In comparison, 112 out of every 100,000 Caucasian women are diagnosed with breast cancer. This presentation will reveal several documented reasons for the lower survival rate in African American women such as diagnosis, poverty, under-treatment, and the nature of cancer.

## II Technology, Genes, and Bacterial Genetics

**EXTRACTION OF TOTAL RNA FROM LIVER AND MAMMARY TISSUES OF MICE TREATED WITH ALCOHOL AND/OR P-NITROPHENOL**

Ameka Catchings<sup>1,2\*</sup>, Joseph A. Cameron<sup>1</sup>, and Jacqueline Stevens<sup>1</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>Hinds Community College, Jackson, MS 39154

The purpose of this research is to determine whether or not alcohol is a risk factors in the development of breast cancer. Our hypothesis is that alcohol-induced modulations of mRNA expression leads to initiation of cancer phenotype and that the inducers of that modulation are breast cancer risk factors. Modest evidence implicates alcohol as a breast cancer risk factor and alcohol specifically induces cytochrome P450-2E1 (CYP2E1). We expected that alcohol would induce CYP2E1 in MCF-7 cells, but preliminary data in our laboratory indicates that ethanol treatment also induces CYP3A4. Total RNA isolation and probing for specific CYP2E1 and CYP3A4 mRNA expression after treatment of Balb-c mice with alcohol and other CYP inducers will provide a model system of metabolic activation by alcohol and/or co-treatment and serve as an biomarker of breast cancer risk, placing women who drink alcohol at higher risk of breast cancer development than unexposed women. We demonstrate varying levels of expression of total cellular RNA isolated from mouse liver and mammary samples following treatment with our test inducers. Total RNA was denatured with 7% formaldehyde and then was separated on 1% agarose gels. The gels were stained with ethidium bromide and photographed under UV light. (Supported in part by NIGMS R25 GM50117).

# EFFECTS OF SUSTAINED AND CONVENTIONAL DELIVERY OF ESTROGEN ON THE PROLIFERATION OF SiHa CERVICAL CARCINOMA CELLS IN CULTURE

Joyce Brewer\*, Hamed Benghuzzi, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39216

The objectives of this investigation were (i) to evaluate the effect of estrogen on SiHa cervical cells delivered by TCPL delivery system versus conventional administration as a model for cervical cancer intervention, and (ii) to determine the estrogen dose effect on proliferation of these cells in culture. Estrogen was delivered to these cells for three time periods, 24, 48, and 72 hours both by conventional administration [direct administration] and by drug delivery system using TCPL ceramic capsules. Three Dosages of estrogen were selected for this study [2, 10, and 100 pg/mL]. Ceramic capsules were prepared in our laboratory using standard procedures [release profile 2, 10, and 100 pg/ml]. Capsules were then gas sterilized prior to being placed in the wells with cells. Data collected from this study indicated that, regardless of the route of administration, estrogen exposure did not induce major cellular injury at all concentrations. Initially, there were various responses to estrogen among all groups compared to control. At 72-hour phase all experimental groups induced greater proliferation rate in the conventional delivery than in the groups exposed to sustained estrogen delivery. Low and medium doses conventionally added to the cells resulted in a decrease in cell number at 48-hour phase compared to the initial response (24-hour phase). With the use of medium and high sustained delivery of estrogen rates, the data revealed that proliferation rate is directly proportional to duration of delivery compared to conventional means. The data suggest that the route of administration of estrogen is an instrumental tool in the prognosis of cervical cancer. \*Ph.D. Student, CHS Graduate Program, UMC

# ANTIBIOTIC RESISTANCE AMONG GRAM NEGATIVE BACTERIA IN A HOSPITAL ICU

G. Ballard<sup>1</sup>\*, H. White<sup>2</sup>, Susan Bender<sup>1</sup>, Cindy Cook<sup>1</sup>, and Donna Sullivan<sup>2</sup>, <sup>1</sup>Base Pair Program/HHMI and Jackson Public Schools, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Susceptibility data derived from surveillance studies can gauge emerging resistance problems. Several recent studies have shown increasing incidence of antibiotic resistance concomitant with increased use of these drugs. In this survey, 100 consecutive gram-negative aerobic isolates recovered from ICU patients were identified to species level. Susceptibility tests were performed with a standardized microtiter minimal inhibitory concentration (MIC) panel (Dade International MicroScan, CA). Testing was conducted according to the National Committee for Clinical Laboratory Standards and MICs validated with ATCC test strains. MICs were determined for 16 antibiotics. The most commonly isolated pathogens were *Enterobacter cloacae* (20%), *Pseudomonas aeruginosa* (16%), *Klebsiella pneumoniae* (14%), *Serratia marcescens* (11%), and

*Acinetobacter baumannii* (10%). National surveys report similar percentages for *E. cloacae*, *P. aeruginosa*, and *K. pneumoniae*. Overall, the activity of ciprofloxacin to the most common isolates in this study was 91.4%, above the national average of 76% in 2000. *P. aeruginosa* susceptibility to ceftazidime was 56% vs 80%, cefotaxime 100% vs. 13%, and ciprofloxacin was 81% vs. 76% in is study compared to national data from 2000. Some of these differences may reflect differences in prescribing patterns. This study represents the first series in a five year ongoing study.

# FRACTURE HEALING IN RESPONSE TO CONTINUOUS SUSTAINED DELIVERY OF DEMINERALIZED BONE MATRIX PROTEINS AND TOBRAMYCIN

Chris Galjour\*, Sergey Dzigan, Matt Graves, Hamed Benghuzzi, George Russell, Michelle Tucci, and Audrey K. Tsao, University of Mississippi Medical Center, Jackson, MS 39216

Demineralized bone matrix (DBX) is an allogeneous, bioabsorbable material that has long been used for its osteo-inductive and osteoconductive properties. A significant complication experienced by physicians who perform bone defect filling surgery is the risk of subsequent bacterial infections and the inefficiency of oral antibiotics to provide adequate prophylaxis against microorganisms, especially *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Staphylococcus epidermidis*. In order to deliver both demineralized bone matrix and an efficient antibiotic at high local concentrations without deleterious systemic effects, a ceramic sustained delivery system was implanted and monitored over the course of 30 days for bone regeneration, infection, and systemic effects. Twenty-five Sprague Dawley albino male rats were used in the experiment. They were randomly divided into five equal groups. Animals in group 1 were used as control, in group 2 had a created 5mm defect, in group 3 defect with the antibiotic alone, in group 4 had a created defect plus DBX, and group 5 had a created defect plus antibiotic and DBX. At 30 days post-implantation, the experimental animals showed no significant difference in weight when compared to the control and sham animals. X-rays taken at this time showed the experimental femurs to be totally healed and virtually indistinguishable from control. Initial dissections revealed that the implants were accepted by the hosts as shown by the fibrous, vascularized sheath that surrounded the femurs and capsules. The implants were found to be in close contact with the cancellous bone and none of the sheaths showed signs of infection. Macroscopically, no defect could be detected in the experimental animals, while little regeneration was observed in the femurs of the sham animals.

\*Medical student (second year), UMC

# THE EFFECTS OF DEMINERALIZED BONE MATRIX ON BONE CELL FORMATION

Tabitha Hardy<sup>1\*</sup>, Hamed Benghuzzi<sup>2</sup>, George Russell<sup>2</sup>, Michelle Tucci<sup>2</sup>, and Joseph A. Cameron<sup>1</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Demineralized bone matrix protein (DBM) has been used to reconstruct bone. The studies have shown that DBM induces new bone formation when it is implanted subcutaneously or intramuscularly. The effects of DBM at the cellular level have not been clearly defined. MG-63 cells were plated onto 24 well tissue culture plates at a density of  $1 \times 10^5$ . Cells were exposed to 30% or 100% DBM proteins for periods of 24, 48 and 72 hours and compared with untreated controls. After each incubation period, cell morphology, cell damage, cell number, and protein concentrations were determined. Preliminary results indicate a significant increase in cell number at 24 hours in both DBM treated groups. The increase was still evident after 48 hours in the 100% DBM treated cells. Cellular protein levels at 24 and 48 hours for the DBM treated cells were also increased when compared to control. The treatments did not cause an insult to the integrity of the cell membrane as evidence by lack of difference in the malondialdehyde levels. Morphological differences were observed in treated cells after 24 and 48 hours. The cells treated with both concentrations of DBM had structural differences as well as an increase in nuclear swelling and evidence of prominent nucleoli. The early increases in cell number and cellular protein content indicate the DBM is effective in stimulating cell growth. Closer evaluation of the morphology especially the changes occurring at the nuclear level need to be addressed. (Supported in part by NIGMS R256M067592) \*Graduate Student, Jackson State University

# THE EFFECTS OF SUSTAINED DELIVERY OF THYMOQUINONE ON BONE HEALING OF MALE RATS

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The use of natural products as an alternative to conventional treatment of various diseases is on the rise. *Nigella sativa*, a natural herb has been used for many acute as well as chronic conditions. The objectives of this study were (1) to successfully deliver the active component of black seed, thymoquinone (TMQ), at sustained level using a tricalcium phosphate delivery system (TCPL); (2) to evaluate the effects TMQ on bone healing (femur) in adult male rats. Fifteen animals were randomly divided into three equal groups. Group I animals served as controls, those in group II served as sham, while group III served as TMQ experimental group (0.2 g TCPL). Blood, x-rays and body weights were collected and recorded weekly. Metabolic biomarkers were also evaluated weekly. At the end of 30 days, animals were sacrificed and

vital as well reproductive organs were collected and analyzed morphometrically. The results revealed the following: (i) gross anatomical observation indicated an increase in the healing pattern of animals in the TMQ group compared to those in group II (sham); (ii) no significant differences were detected in the levels of cholesterol, proteins, malondialdehyde and alkaline phosphatase in all groups; and (iii) no significant differences were observed in the weights of vital as well as reproductive organs in all the groups. In conclusion, it appears that TMQ can enhance bone healing with little or no side effects on major vital and reproductive organs.

# COMPARISON OF RADIOGRAPHIC TECHNIQUES TO OPTIMIZE IMAGE ANALYSIS FOR EVALUATING TRAUMATIZED BONE USING A RAT AS A MODEL

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The search for an ideal, safe, efficient and cost-effective protocol to assess the daily progression in osteogenesis is in the rise. The specific objective of this investigation was to employ various combinations of radiographic techniques that may optimize image analysis in orthopedics setting. Surgically induced femoral fractures immobilized with metallic plates and screws of adult male laboratory rats were used as a model ( $n = 50$ ). The techniques were utilized to study excised specimens with the induced fractures. Specifically, conventional radiographic methods as well as those that are used for specimen radiography in clinical methods were utilized. For routine radiography, a portable x-ray machine was used and a Faxitron was used for specimen radiography. Exposure factors (kv, time), type of film, and magnification was varied in experiments using Faxitron. Two clinical film mammography machines were employed for all selected excised femurs. To obtain object magnification the distance between the film and the object was varied to bring the object closer to the x-ray tube. An aluminum wedge [standard density of  $1.98 \text{ gm/cm}^3$ ] was included in the radiographs along with the specimens to obtain density measurements. The criteria of evaluation for the images included: (a) visualization of the immobilizing hardware; (b) evaluation of the fracture site; (c) evaluation of the rest of the bone specimen, and (d) evaluation of the soft tissues. Images obtained with the portable radiographic equipment showed the least amount of spatial and contrast resolution while the results obtained with Faxitron and the mammographic machines showed much higher contrast and spatial resolution. Optimal soft-tissue resolution was difficult to obtain with any of the techniques.

# MODULATION OF CYTOCHROME P450 PROTEIN AND GENOTYPIC EXPRESSION IN MOUSE LIVER AND MAMMARY TISSUES IN RESPONSE TO TREATMENT WITH ALCOHOL AND/OR P-NITROPHENOL

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We propose that multiple exposures increase the probability of breast cancer development by modulating cytochrome P450 (P450) protein synthesis and redirecting the metabolism of P450 substrates to more toxic pathways in breast cells. This lead us to question whether or not co-treatment with alcohol and p-NP would lead to complex metabolic interactions of biotransformation products in breast cells and subsequent consequences, different than those due to treatment with each compound alone and different than those induced in liver. Modulation in CYP ratio is a critical determinant of breast cancer risk, and therefore, this system represents a critical focal point in our inquiry. We compared P450 protein expression profiles obtained following alcohol/p-NP co-treatment to those observed following treatment with each compound alone in mouse mammary and liver samples. This screen for synergistic, agonistic or antagonistic effects caused by combined treatment revealed that treatment with ethanol alone leads CYP3A4 protein and mRNA expression compared to untreated samples and samples treated with p-NP alone, and combined exposure. This study represents an examination of ethanol as a potential breast cancer risk factors and the effects of combined exposures, which is relevant toward understanding tissue-specific biotransformation events and perhaps drug-drug interactions. (Supported in part by NIGMS R25 GM50117).

# THE EFFECTS OF SUSTAINED DELIVERY OF GLUCOCORTICOIDS ON THE KIDNEY OF FEMALE RATS

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Chronic increased levels of glucocorticoids may impair renal function. The use of antioxidants has been shown to reduce renal tubular injury in cases of increased glucocorticoid administration *in vitro*. The objectives of this study were: (1) to establish an animal model of increased glucocorticoid levels by sustained delivery and (2) to determine if sustained delivery of selenomethionine in combination with glucocorticoids can protect kidney tubular structures. Sixteen female rats were divided into 4 equal groups (control and 3 experimental groups implanted with tricalcium phosphate lysine drug delivery systems (TCPL) charged with either 50 mg selenomethionine (SE), 50 mg cortisol (C), or 50 mg of both C and SE). At the end of 30 days, the rats were sacrificed and both kidneys were removed for histological analysis. Quantitative analysis was performed on serum calcium levels, body weights and kidneys weights in all groups. Kidneys slides were evaluated for changes in kidney morphology namely change in

area and width. Sustained release of C resulted in a significant reduction of glomerular area. SE administration alone did not alter kidney structure and was not able to protect against the changes caused by C when co-administered. C, Se and C + SE caused a significant ( $p < 0.05$ ) reduction in serum calcium levels compared with control. The reduction may be in part to changes in calcium-filtered load, changes in glomerular filtration rates or interference of calcium absorption from the gut. In conclusion, high levels of cortisol will modify kidney structure and possibly alter blood pressure. \*Allied Health Undergraduate, UMC

# EFFECTS OF ANTIOXIDANTS ON ULTRAVIOLET LIGHT INDUCED MORPHOLOGICAL CELLULAR DAMAGE IN MRC-5 CELLS

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Recent studies have indicated the use of antioxidants offers protection against various types of cancers. The goal of this study was to use an established tissue culture model (MRC-5 cells), to assess cellular damage after exposure to ultraviolet light (UVL), and to determine if vitamin E addition after exposure can alleviate cellular damage. The specific aims were to evaluate the morphological responses of MRC-5 fibroblast cells exposed to UVL followed by vitamin E supplementation. MRC-5 cells were divided into three groups. Group I cells served as control, group II cells were exposed to UVL for 60 minutes, and group III cells were exposed to UVL for 60 minutes followed by addition of vitamin E (100  $\mu$ L of 1000 IU). All groups were incubated for periods of 24, 48, and 72 hours. After each incubation period cellular damage was assessed using cell number determination and by determination of cellular and supernatant MDA levels. Vitamin E post exposure provided a protective role by demonstrating lower levels of MDA ( $p < 0.05$ ) as well as normal structure appearance. (Supported in part by NIGMS R25 GM50117).

# DEGRADATION OF VITAMIN E IN THE PRESENCE OF ULTRA-VIOLET LIGHT

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Vitamin E is a lipid-soluble antioxidant in the biological membrane that contributes to membrane stability by protecting critical cellular structures against damage from oxygen free radicals and reactive products of lipid peroxidation. Vitamin E is an important anti-oxidant. It acts as a free radical scavenger to prevent the byproducts of chemical-cell interaction that cause cell damage. Studies have reported vitamin E to protect against some of the toxicities of ionizing radiation. One source of ionizing radiation is UV light, and

numerous products containing vitamin E are sold to block UV light. The goal of this investigation was to determine the effect of prolonged UV light exposure on vitamin E. Our hypothesis was that UV light will degrade vitamin E and diminish its antioxidant capacity. To test our hypothesis, vitamin E was prepared at a concentration of 0.075 M and exposed to UV light for a duration of 0, 5, 15, 30, and 60 minutes. After each exposure period, vitamin E was determined spectrophotometrically and compared with the non-exposed sample. Decreases in peak absorbance were noted as early as 5 minutes post exposure and continued to decrease with each exposure time. Measurements of thiobarbituric reactive species were also higher in the UV exposed samples indicating a decrease in antioxidant capacity. In conclusion, UV light causes degradation of vitamin E rendering it an ineffective antioxidant. Undergraduate Student, Millsaps College

#### PATHOPHYSIOLOGICAL RESPONSE OF MRC-5 FIBROBLAST CELLS TO DEMINERALIZED BONE MATRIX PROTEINS

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Demineralized bone matrix proteins (DMB) have been used recently as an osteogenic agent that promotes fracture healing. We hypothesize that increased osseous formation by DMB leads to less adverse effects such as non-union and underlying infection. However, the effect of varying concentrations of (DMB) on the cells of the surrounding soft tissue has not been investigated. The specific goal of this study was to evaluate the biochemical and morphological changes in MRC-5 fibroblast cells treated with either 30% DBM proteins or 100% DBM proteins [24, 48, 72 hours incubation]. Cell growth in both 100% and 30% treatments showed a significant increase after 24 hours ( $p < 0.05$ ). However at 48 and 72 hours there was not a substantial difference in cell numbers when compared with control. Cellular damage was not evident as indicated by the MDA levels for the treated groups at 24 and 72 hours. There was a slight but insignificant increase in MDA levels compared to the control at 48 hours. Cellular proteins were reduced in both DBM treated groups for the duration of the experiment. Morphologically, significant changes were evident as early as 24 hours. The 100% DBM treated cells also exhibited a prominent nucleoli and moderate coarse chromatin at 48 hours. Cellular rounding and cytolysis were also observed in both treated groups. Overall, DBM proteins can alter fibroblast cellular metabolism and cellular morphology. The results show a need for further characterization of these compounds on soft tissues.

#### ROLE OF THE N-TERMINAL DOMAIN IN SIGNAL TRANSDUCER AND ACTIVATOR OF TRANSCRIPTION PROTEIN 4 ACTIVATION

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Signal Transducer and Activator of Transcription 4 (STAT4) mediates responses to Interleukin (IL)-12. Following IL-12 binding to its receptor, the Janus kinases, Jak2 and Tyk2, are activated to phosphorylate tyrosine residues on the IL-12 receptor. The STAT4 SH2 domain binds to IL-12R phosphotyrosines allowing STAT4 to become phosphorylated by the Janus kinases. STAT4 can then homodimerize, move to the nucleus, bind DNA and activate transcription. All STAT proteins have a conserved N-terminal domain shown to be important for phosphorylation and gene transcription. Our previous studies suggested that the N-terminal 51 amino acids of STAT4 are required to mediate the activation of STAT4. To determine precisely which region of the N-terminal domain is required for phosphorylation, we have generated a series of N-terminal truncated STAT4 mutants. Mutants that lack the amino terminal 10 amino acids are phosphorylated similarly to full-length STAT4. However, Jak2 less efficiently phosphorylated mutants lacking the 44, 51, or 75 amino-terminal amino acids than full-length STAT4. In contrast, full-length and mutant STAT4 proteins were capable of interacting with a phosphorylated receptor peptide. Thus, an N-terminal segment of STAT4 between amino acids 10 and 44 is required for efficient phosphorylation by Janus kinases but is dispensable for STAT4 recruitment to the IL-12R complex. (Supported in part by NIGMS R25 GM067592 and R01 AI45515).

#### EXPRESSION OF VARIANT PSPAs IN *STREPTOCOCCUS PNEUMONIAE* WU2

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PspA is a surface protein present on all pneumococci, is required for full virulence, and is capable of eliciting protective immune responses. In mice, some pneumococcal strains are more virulent and difficult to protect against than other strains even though the mice are immunized with PspA fragments from the homologous strain. To examine the role the genetic background on protection in which a particular PspA resides, a mutant of *Streptococcus pneumoniae* WU2 was constructed by allelic replacement of *pspA*/WU2 with *pspA*/BG9737. An erythromycin resistance cassette was inserted downstream of *pspA* in *S. pneumoniae* BG9739. This was achieved by insertion duplication mutagenesis in which BG9739 was transformed with a plasmid containing homology to the region of *pspA* encoding the C-terminus. Genomic DNA from the resultant strain was used to transform WU2. Any resultant transformants should have replaced *pspA*/WU2 with *pspA*/BG9739 by homologous recombination at two sites. The expression of PspA/BG9739 in the WU2 mutant was confirmed by Western blot and flow cytometry. This work was supported (in part) by the Howard Hughes Medical Institute.

# THROMBOCYTOSIS ASSOCIATED WITH ANTI-FUNGAL THERAPY AND CANDIDEMIA

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**Purpose:** Platelet counts  $>400,000/\text{mm}^3$  worrisome due to the associated increase in incidence of gastrointestinal tract bleeding and stroke. Secondary, "Reactive", thrombocytosis has been attributed to bacterial infection and multiple pharmaceuticals. Our purpose is to report a case series of thrombocytosis observed in patients treated with anti-fungal therapy for disseminated candidiasis. **Methods:** Three groups (candidemia with anti-fungal therapy, candidemia without anti-fungal therapy and anti-fungal therapy without candidemia) containing patients treated at university medical center and over the age of 18, were evaluated for presence of anti-fungal therapy and candidemia in a retrospective manner. Platelet administration, pharmacologic or pathologic contributors to thrombocytosis, and other pertinent details related to thrombocytosis were also evaluated. **Results:** Reactive thrombocytosis was observed in 10% of candidemia patients treated with an azole. Within the sub-group affected by reactive thrombocytosis associated anti-fungal therapy and candidemia, life-threatening thrombolytic complications were common. Mean baseline platelet counts were  $354,500/\text{mm}^3$  with a mean peak ( $695,000/\text{mm}^3$ ) occurring 13 days after initiation of therapy. The maximum peak ( $1,056,000/\text{mm}^3$ ) was observed in a patient 14 days post-therapy initiation. Mean time to onset was 4 days and duration of thrombocytosis was 4 days post therapy. **Conclusions:** Thrombocytosis occurs during the treatment of candidemia. The causative agent (drug vs disease) will need to be elucidated by a larger epidemiological trial addressing the extrapolatability of these results, addressing risk associated with this reaction and whether treatment is necessary.

# ETHNICITY INFLUENCES THE DISTRIBUTION OF CYTOCHROME P450 3A4 GENE POLYMORPHISM

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Cytochrome P450 (CYP 450) is a heme-containing enzyme, which plays an important role in the metabolism of a variety of drugs including cyclosporin. CYP3A4 exhibits an inter-individual variation in expression levels. It is hypothesized that such variations in the level of expression are caused by polymorphisms within the regulatory element of the gene. Thus, we are interested in investigating such polymorphisms in different ethnic population. We have isolated DNA from blood samples obtained from 142 African Americans (AFAM) and 99 Caucasians (CAU). DNA was tested in a PCR assay using sequence specific nucleotide primers and Taq polymerase. The primers are representing either nucleic acid A at position -290

(natural type) or nucleic acid G at position -290. The assay was performed in a 9600 Thermal Cycler using a procedure common in the laboratory. The amplification product was tested in a 2% agarose gel electrophoresis. Genotypes were detected based on the presence or absence of the amplification product. Any ambiguity in genotype detection was resolved by gene cloning and sequencing. CYP3A4 G genotype was present with a higher frequency in AFAM individuals as compared with CAU (AFAM 80% VS 3%,  $p < 0.0001$ ). Whereas, the homozygous AA was present in the majority of CAU (97%) but only 17% in AFAM. Furthermore, females in both groups carry fewer homozygous AA as compared with males (AFAM Male:63%, Female:37%, CAU Male:66%, Female:34%). Such polymorphism in CYP3A4 gene might affect on the levels of CYP3A4 protein production and subsequent variations in the metabolic rates and drug clearance.

## III Animal Models and Chemistry

### SYNTHESIS AND CHARACTERIZATION OF COOPER (II), NICKLE (II), ZINC (II) COMPLEXES OF SCHIFF BASE DERIVED FROM 1,2-DIAMINOBENZENE AND 2,5-DIHYDROXY BENZALDEHYDE

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Transition metal complexes derived from Schiff bases are found to have biological, clinical and analytical applications. The activity of the metal complexes is enhanced compared to their parent organic molecule due to coordination with metal ions. In view of this perspective, we have synthesized complexes of copper (II), nickel (II), and zinc (II) using Schiff base derived by the 1:2 molar condensation of 1,2-Diamino benzene and 2,4-dihydroxy benzaldehyde in methanol. The Schiff base formed complexes with the above metal ions in a 1:1 molar ratio through oxygen, nitrogen (ONNO) atoms. The complexes were characterized on the bases of their molar conductance, IR, UV-Vis, and <sup>1</sup>HNMR spectral studies. IR, UV-Vis spectral data suggested that all the complexes are square planar in nature. The metal complexes exist as monomers and behave as non-electrolytes in DMSO solution. The data obtained by this study will be helpful in designing new ligands with potential applications as an analytical reagent for metal ions. Further, the metal complexes can be used as potential candidates in the study of photo-induced electron transfer interaction with DNA (Supported in part by NIGMS R25 GM50117).

# THE SYNERGISTIC EFFECT OF ANTIOXIDANTS IN COMBINATION ON LNCAP PROSTATE CANCER CELL LINE

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The most common male cancer in the United States is prostate cancer. It has been postulated that prostate cancer will be the leading cause of cancer deaths in men for the next decade unless new interventions are discovered. The goal of this study was to develop treatment and prevention methods for the invasive behavior of prostatic mutations by exploring the synergistic effects of several antioxidants in a combined manner. The specific aims were to examine the viability and proliferation of human prostate cells in culture upon combined treatment of low and high doses of vitamin E, selenium, and lycopene. Various groups were treated in combination to observe synergistic effects. Data demonstrated that the combination group containing lycopene, vitamin E, and selenium tended to portray the greatest decrease in PSA levels. One suggestion could be that vitamin E has no effect on the making of PSA, but has a greater effect on the cell number, which resulted in decreased PSA values.

# DELIVERY OF STATIN AND VANCOMYCIN BY MEANS OF A TRICALCIUM PHOSPHATE LYSINE (TCPL) CERAMIC DELIVERY SYSTEM IN A RAT FEMORAL DEFECT MODEL

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The potential role of statin in bone metabolism as well as the effects of the drug on the reproductive organs has not been fully elucidated. Therefore, the specific aim of this study was to develop a statin delivery system for treatment of a femoral defect, and evaluate the vital and reproductive organs 30 days post-op. The study consisted of 14 rats divided into three groups. Group I animals (n = 5) served as control. Animals in groups II (n = 5) and III group (n = 4) received a 5 mm femoral defect and implanted with TCPL delivery containing antibiotic or statin + antibiotic, respectively. Blood, x-rays and body weights were evaluated weekly. All the animals were euthanized at 30 days. The reproductive and vital organs were collected, weighed and histopathologically evaluated. The data showed no structural damage. The result showed that the TCPL ceramics were capable of delivering statin at a sustained level for four weeks. Body, vital and reproductive organ weights were not significantly different. Total testosterone, LH, and FSH levels of the animals implanted with statin loaded TCPL were not significantly different ( $p > 0.05$ ) from the sham and control groups. The observation in this study suggests that TCPL delivery system can be used to release statin at a sustained level for long duration without negatively affecting

the reproductive function. \*Clinical Health Sciences Graduate Student, UMC

# INHIBITION OF VAGINAL KERATINIZATION IN ADULT FEMALE RATS EXPOSED TO PHYSIOLOGICAL LEVELS OF ESTROGEN

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The short length of the estrous cycle in rats (4 days) allows for rapid observations of changes that occur during the reproductive cycle. The aim of the present work was to provide the literature with helpful considerations regarding the distribution of cornified cell determinations during proestrus, estrus, metestrus and diestrus in rats receiving estrogen. Eight female rats (four control and four experimental) were (R1-R8) used in this study. Cyclic activity at 2, 4, 8, 12, 24, 36, 48, 72 hours were determined. Briefly, 0.5 ml Hank's solution was placed within the vaginal canal for few seconds followed by aspiration. This mixture was then smeared onto microscopic slides and stained using a routine PAP and Diff Quick (DQ) staining methods. Data obtained revealed that the PAP stain proved to be a better staining technique than the DQ stain in both nuclear and cytoplasmic details. Histologically, keratinization of the vaginal epithelium appeared to be evident at the estrus phase (day 4) of a 4-day cycle (3 rats out 4). This keratinization process is dependent on the endogenous estradiol secreted between the evening of diestrus 2 (day 2) and that of proestrus (day 3). In the second stage of this experiment, the rats labeled R1-R4 were used as controls, whereas lab rats R5-R8 had estrogen administered (2 mg/ml) to them for three days. The results showed a significant increase in the proliferation of degenerative cells in the E treated rats compared to control animals. Inhibition of vaginal keratinization was obvious and this protocol can be used as a rapid and convenient *in vivo* investigational model for screening the effects of agents that have antikeratinizing activity. \*Clinical Health Sciences Graduate Student, UMC

# THE EFFECTS OF CONTINUOUS ADMINISTRATION OF CORTICOSTERONE AND SELENOMETHIONINE ON THE HEART MUSCLE OF MALE AND FEMALE RATS

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A direct comparison of heart tissue between males and females under continuous cortisol stimulation has not been fully elucidated. The aim of this study was to determine the effects of continuous corticosterone and antioxidant administration on the male and female rat myocardial tissues. A total of 24 rats were divided into six equal groups control (male-c and female c), TCPL implanted groups containing corticosteroid (M cort and F cort), corticosteroid + selenomethionine (M combo and F combo). At the end of 4 weeks the animals were sacri-

ficed and the heart tissue was collected, weighed, divided into apex, left ventricle and right ventricle then processed for routine histological evaluations. Bundle lengths, width and myocyte numbers were determined. The data showed MC and FC had the highest number of myocytes present in the apex, and both ventricles. M-cort animals had higher numbers of myocytes present in the ventricles compared with M-combo group and M-combo had more myocytes in the apex. Interestingly, the female rats had the exact opposite scenario. Measurements of bundle lengths were also different between female and male animals. In the apex of the female rats the lengths were in the following order comb>cort>control, whereas in the male the order was control>comb>cort. The right and left ventricle bundle fiber measurements were also different between the males and females M-comb>M-cort> MC and in the female they were reversed. This information collected in this experiment showed the male and female hearts respond differently to continuous administration of both stress hormone as well as anti-oxidants.

**SUSTAINED RELEASE OF OP-1 AND ANTIBIOTICS IN TREATMENT OF FEMORAL DEFECTS IN MALE RATS**  
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Osteogenic proteins (OP-1) promote osteoinduction. Formation of new bone growth in patients receiving OP-1 is not consistent, and is possibly due to the short half-life of the drug. In order to test the capacity of OP-1 to consistently produce bone in a fracture model a drug delivery system was developed to prolong the action of OP-1. Fifteen Sprague Dawley male rats were randomly divided into three equal groups. Animals in group 1 served as control. Animals in groups 2–3 had a 5 mm defect created in the left femur using a number six dental burr and a drug delivery capsule (TCPL) containing either antibiotic alone (sham) or antibiotic +OP-1. Body weights, blood, and X-rays were taken weekly. Femurs and organs were harvested 30 days post-op, and processed for histomorphometry. Data was analyzed using ANOVA and significant difference between the groups was determined using Student Newman Kuels ( $p < 0.05$ ). The results showed complete bone healing in the OP-1 group with an evident callus formation. The osteoid tissue exhibited a proliferation of osteoblasts, which differentiated from the vascularized mesenchymal tissue. The complete bone healing using OP-1 was sharply contrasted sham treatment, where an obvious injury was still seen at 30 days. Histologically sham animals exhibited the early stage of repair with evidence of blood clotting and mesenchyme with early formation of osteoblasts. Overall, Op-1 delivered in a sustained manner for 30 days caused increased bone in a defect model.

**EVALUATION OF ANTIOXIDANT COMPONENTS OF FRACTIONATED BLACK SEED**  
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*Nigella sativa* has been used for thousands of years in the Middle East for allergies, asthma and for treating immune disorders. The seeds are known to contain essential amino acids, phytosterols, lipase, fatty acids, tannins, and thymoquinones. The essential oil of *Nigella sativa* seeds has antioxidant properties. The active constituents of *Nigella sativa* oils are thymoquinone, dithymoquinone, thymohydroquinone, thymol, carvacrol, and 4-terpineol. The purpose of the following study was to fractionate black seed and evaluate the fractions for anti-oxidant properties and compare with vitamin E a potent antioxidant. Black seeds were pulverized and twenty milligrams were extracted by either hot water or ethanol over a period of four days. The water-extracted fraction appeared yellow-white to light brown, while the alcohol fraction appeared clear to light brown. The water fraction most likely contained tannins, which are esters of sugar, and the alcohol fraction most likely contained thymoquinone. The fractions were evaluated for their ability to scavenge lipid radicals in an in vitro lipid peroxidation assay. The results show that each of the isolated fractions were able to scavenge approximately 50% of the generated radicals where as pure vitamin E was able to scavenge in a dose dependent fashion between 75 to 90% of the radicals generated. Pure thymoquinone was able to quench radical formation in a dose dependent fashion between 50–72%. Overall, the water and lipid soluble fractions of black seed contain potent antioxidants. \*Allied Health Undergraduate Student, UMC

**PROTEOMIC ANALYSIS OF TYROSINE PHOSPHORYLATED PROTEINS IN THE FRONTAL CORTEX OF BUTORPHANOL-DEPENDENT RATS**

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Butorphanol (17-cyclobutylmethyl-3,14-dihydroxymorphinan) tartrate (Stadol) is a mixed agonist-antagonist opioid analgesic agent that produces about five to seven times as potent as morphine in analgesic effects. The chronic use of butorphanol produces physical dependence in humans as well as in animals. Post-translational modifications such as phosphorylation play a very important role in developing dependence. The aim of this study is to determine tyrosine phosphorylated proteins in the frontal cortex of butorphanol-dependent rats using proteomic approach. Dependence was produced by continuous intracerebroventricular (i.c.v.) infusion of butorphanol (26 nmol/μm/hr) for 72 hours via osmotic minipumps in rats. Proteins were separated by two-dimensional gel electrophoresis (2-DE) and 90 tyrosine phosphorylated protein spots were detected by immunoblotting with anti-phosphotyrosine specific antibodies. About 35 phosphotyrosyl spots showed predominant changes in comparison with that of control rat brains. Some of these spots were identified by matrix-assisted laser desorption/ionization mass spectrometry



(MALDI-MS). Proteins involved in cell cytoskeleton, cell intermediary metabolism, and cell signaling mechanism such as tubulin, pyruvate kinase, aldolase C, and glutamine synthetase were identified. This proteomic approach may provide useful information to understand complex mechanism of butorphanol dependence. This work was supported by DA05828.

#### DOPAMINE RECEPTOR BINDING AND APOMORPHINE-INDUCED LOCOMOTOR ACTIVITY IN $\mu$ -OPIOID RECEPTOR KNOCKOUT MICE

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Previous studies from our laboratory have indicated possible interactions between opioidergic and dopaminergic neurons in the central nervous system. In this study, apomorphine-induced locomotor activity and the D1 and D2 subtype dopamine receptor binding were examined in mice lacking the  $\mu$ -opioid receptor genes. The ambulatory time, vertical time and total motor distance of locomotor activity were measured after administration of apomorphine (2 mg/kg, i.p.) for a period of 90 min. The autoradiographic studies of D1 and D2 dopamine receptors were conducted using [<sup>3</sup>H]SCH23390 and [<sup>3</sup>H]raclopride as ligand, respectively. In wild type mice that received apomorphine, 2 mg/kg, i.p., the locomotor activity such as ambulatory time, vertical time and total motor distance were not significantly altered as compared with that of the saline control group. However, the locomotor activity measured was significantly increased in the same dose of apomorphine treated  $\mu$ -opioid receptor knockout mice between 5 to 40 min after administration. The results obtained also show that the binding of D2 dopamine receptor in  $\mu$ -opioid receptor knockout mice was significantly higher than that of the wild type in the caudate putamen. However, the binding of the D1 dopamine receptor in  $\mu$ -opioid receptor knockout mice was not significantly different from that of the wild type. It appears that the apomorphine treated  $\mu$ -opioid receptor knockout mice showed enhancement in locomotor activity. The enhanced locomotor activity may be related to the compensatory up-regulation of D2 dopamine receptors in mice lacking  $\mu$ -opioid receptor genes. This study was supported by the Human Science Grant Foundation of Japan.

#### THE EFFECTS OF VINCA ALKALOIDS ON *TRYPANOSOMA LEWISI* IN RATS

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Trypanosomiasis is one of the top 10 parasitic killers in the world and has surpassed AIDS as the leading cause of death in some African nations. Much research has been done on

the causative agents of this disease, *Trypanosoma brucei gambiense* and *T. brucei rhodesiense*. Wosu and Ibe (1989) suggested that botanical compounds are effective in controlling these parasites. Based on their study, an experiment was set up to investigate the effects of *Vinca* alkaloids related to the compounds used in the original research. Sprague-Dawley rats were infected with a non-pathogenic trypanosome species, *Trypanosoma lewisi*. Varying doses of the *Vinca* alkaloids vinblastine and vincristine were administered to subgroups of the rats and the numbers of the trypanosomes were monitored to observe the treatment's effects. Compared to the control group, the rats that received a lower dosage of vinblastine had lower levels of parasitemia. High dosages of vinblastine and vincristine did not seem advantageous, as they appeared to increase parasitemia when compared to the control group and in most cases were lethal. This could be due to suppression of the immune response. Further studies may confirm that low doses of *Vinca* alkaloids may be effective in treating trypanosomiasis.

#### POINT MUTATION ANALYSIS OF PTEN EXONS 1, 3, AND 9 IN TWELVE WILMS' TUMORS, TEN STOMACH CANCERS, ONE MELANOMA, AND ONE LIPOSARCOMA IN MUSCLE

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To detect hereditary mutations caused by the tumor suppressor gene PTEN, we recently analyzed 119 tumor and uninvolved tissue panels of 14 tumor types for point mutations. That analysis was limited to exons 5, 7, and 8 that contain active sites. Here we present the analysis of exons 1, 3, and 9 in twelve Wilms' tumors and ten stomach cancers, and exons 1 and 3 in one melanoma and one liposarcoma. We aimed to sequence tumor tissue and analyze uninvolved tissue only if a point mutation occurred in the matching tumor. Stored DNAs were quality-checked with an Agilent Technologies 2100 Bioanalyzer. Exons were PCR-amplified and purified using gel electrophoresis and QIAEX II gel extraction. Amplicons were sequenced and analyzed with the CEQ 8000 Genetic Analysis System. All exons amplified successfully except exon 3 of two stomach tumors that each failed in 4 of 5 amplifications; the faint band in one amplification probably derived from stromal tissue. Two Wilms' tumors contained the same insertion in exon 1 that, most likely represent artifacts. One Wilms' tumor and six stomach cancers yielded insufficient exon 9 sequence data. All 24 exon 1 sequences, 22 of the 24 exon 3 sequences, and the 16 analyzable exon 9 sequences are deemed normal. Two stomach tumors apparently had lost both copies of exon 3 and at least 247 surrounding bases. In summary, we did not find any point mutations; however, we detected deletions of

both copies of exon 3 in two stomach tumors.

#### TISSUE SPECIFIC INCREASE IN ANTIOXIDANT ENZYMES AND LIPID PEROXIDATION PRODUCTS IN BRAIN OF RATS EXPOSED TO LEAD

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The brain has a high rate of oxidative metabolism, high content of unsaturated lipids and low levels of protective enzymes to eliminate free radicals. Therefore, the brain is prone to oxidative damage. Reactive oxygen species formation has been proposed to be the final common pathway for most of the neurotoxicants. Lead is a potent neurotoxicant. The purpose of this study is to determine the effect of lead on antioxidant enzymes and lipid peroxidation products in different regions of the rat brain. The rats (Wistar strain) were treated with lead acetate (500 ppm) through drinking water for a period of 8 weeks. Controls were maintained on sodium acetate. They were sacrificed by cervical dislocation at intervals of 1, 4, and 8 weeks and the brains were isolated immediately. The brains were washed in ice-cold normal saline solution and the cerebellum, the hippocampus, the frontal cortex and the brain stem were separated on ice. Antioxidant enzymes and lipid peroxidation products were determined at treatment intervals 1, 4, and 8 weeks. The results indicated a gradual increase in the activity of antioxidant enzymes, more in the cerebellum and hippocampus, and the response was time-dependent. The data suggests a region specific oxidative stress in the brain. The increase in lipid peroxidation products might be due to damage caused to membrane lipids by lead toxicity. Lead exposure might have resulted in the formation of excessive reactive oxygen species causing enhanced levels of antioxidant enzymes. (Supported by NIH/FIC/MIRT #T37 TW00132 and NIH/NIGMS/SCORE #GM 55356)

#### IV Cell Cultures and Immunology

##### THE EFFECT OF CORTISOL AND SELENOMETHIONINE ON KIDNEY EPITHELIAL TUBULAR CELLS

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Glucocorticoids play an essential role in maintaining homeostasis and regulation of normal growth and functions of a variety of organs. In the kidney, it modulates renal glucocorticoid receptors and effects Na-K ATPase activity, but can have dampening effects on the body when in excess. Antioxidants are useful in combating the effects of glucocorticoid on the total body excess and its function is well documented. However, the effects of glucocorticoids on epithelial cell structure and function are not well defined. In our investigation we examined the viability, proliferation, and morphology of

rhesus monkey kidney cells in culture upon treatment with doses of selenium alone or in combination with doses of cortisol in an attempt to prevent or treat epithelial damage of the kidneys. The experimental design for the cells consisted of exposure to low and high doses of selenium alone, low and high doses of cortisol alone, and a combination of selenium with high dose of cortisol at 24, 48, and 72-hours. Cells were evaluated for viability, cellular protein content, and cellular damage. Cellular viability was not altered in treated cells, however significant increases were observed at 24 hours in the Cortisol<sub>lo</sub> and Combo treated cells. Cellular protein levels were not different for the duration of the experiment. Data obtained showed all treated groups resulted in decreased levels of lipid peroxide generation at 48 and 72 hours. The data suggests that the kidney tubular cells given a bolus dose of cortisol may metabolize the cortisol to an inactive form and are not exposed to toxic effects of continuous release of the drug that would ultimately result in cellular alterations and cellular damage.

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##### PRIMARY RABBIT KIDNEY EPITHELIAL CELLS TREATED WITH SUSTAINED LEVELS OF ALDOSTERONE, AND SPIRONOLACTONE IN A CELL CULTURE

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Elevated plasma aldosterone level may be a contributor to cardiac and renal disease. Administration of sustained levels of aldosterone may alter the viability and integrity of rabbit kidney epithelial cells at 24, 48, and 72 hours. Spironolactone (S) is an antagonist to aldosterone (A) and may offer cellular protection. The main objectives of this study were: (1) to show that aldosterone has an effect on kidney cell viability and that the concentration of aldosterone is important; (2) to show that administration of spironolactone prior to the administration of aldosterone will protect the cells from cellular damage (MDA). Experimental design consisted of thirty tubes of rabbit kidney epithelial cells (Rk) divided into six equal groups (Control (C), S, S+A<sub>lo</sub>, S+A<sub>hi</sub>, A<sub>lo</sub>, and A<sub>hi</sub>). After 24 hours there was a significant decrease in cell proliferation in the following groups S, A<sub>lo</sub>, A<sub>hi</sub>, S+A<sub>lo</sub>. At 48 hours a similar trend in cell proliferation was observed. However, S+A<sub>lo</sub> and S+A<sub>hi</sub> resulted in cell numbers that were higher than the treatments of aldosterone or spironolactone alone. After 72 hours there was a steady decrease in the proliferation in all groups compared to the control. Cellular damage was not evident in the treated groups after 24, 48, or 72 hours. Morphological differences were observed in all treated groups after 48 hours. Presence of nucleoli was most notable possibly indicating increased ribosomal RNA and an increase in protein synthesis. The increase ribosomal RNA also suggests the possibility that the treatments have a direct genomic effect on renal cells. \*Allied Health Undergraduate Student, UMC

# INHIBITORY EFFECTS OF BLACK SEED OIL (*NIGELLA SATIVA*) ON SURVIVAL OF THE HUMAN LIVER CARCINOMA (HEPG2) CELLS

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Black seed (*N. sativa* L.), an oriental spice of the family Ranunculaceae has long been used traditionally as a natural medicine for treatment of many acute as well as chronic conditions including cardiovascular disease and immunological disorders. It has also been used in the treatment of diabetes, hypertension, and dermatological conditions. There have been very few studies on the effects of *N. sativa* and/or its oil extracts as a chemoprevention of chronic diseases as well as in cancer prevention and/or therapy. Oxidative stress is a condition that underlies many acute as well as chronic conditions. The combination and role of oxidative stress and antioxidants *in vivo* is still a matter of conjecture. Our objective for the present study was to expose hepatocarcinoma (HepG2) cells *in vitro* (as a chronic disease example) to commercial seed oil extracts. Measurement of inhibitory effects as reflected by cell survival under various concentrations was conducted using standard cell culture techniques, exposure protocols in 96-well plates and the MTT cell survival assay. Following cellular growth to 90% confluency, 24 h exposure to black seed oil extracts was performed. Cell survival index (LC50) was calculated from percent survival using regression analysis. Results showed there was a dose-dependent inhibitory effects at concentrations ranging from 1.95–1000 ppm. Concentrations of 500–1000 ppm were found to be deleterious to these cells. In conclusion, black seed oil was found to have very strong inhibitory effects on the survival of HepG2 Liver carcinoma cells, unveiling promising opportunities in the field of cancer chemoprevention and/or treatment and warranting further future studies to elucidate the underlying mechanisms. (Supported in part by the NIGMS R25 GM50117).

# THE EFFECTS OF STEROID HORMONES ON THE VIABILITY AND METABOLISM OF A549 CELLS

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Surfactant synthesis by A549 cells has previously been shown in our lab to be stimulated by glucocorticoids. In addition, it has also been shown that sex steroids exert opposing effects, with estrogens accelerating and androgens inhibiting surfactant production. However, the viability, metabolism and morphology of these cells have not been fully characterized in the presence of steroid hormones. The aim of this investigation was to determine the effects of testosterone (T), estrogen (E), androstendione (AED), and a combination of E+T and E+AED on the viability and morphology of A549 cells after 24, 48, and 72 hours. A549 cells were divided into six groups (n=6)

Control, T, E, AED, E+T and AED+E. The groups were evaluated after each incubation period for cellular viability, protein, and changes in morphology. The results of this study showed increased cell proliferation in all treated groups after 24 hours. Significant growth was seen in E, AED, E+T, and E+A (p < 0.001). After 72 hours in culture, the growth was not sustained, and a significant decrease in cell number was detected in all treated groups (p < 0.05). The decrease could possibly be explained by the need for greater nutritional support. At 24 hours slight decreases in protein levels were seen in all groups when compared with control. However, by 48 hours there was significant increase in cellular protein levels (p < 0.05) followed by a rapid decline in cell protein content at 72 hours, further suggesting the culture conditions were compromised and no longer able to support the rapid growth. Overall, the results suggest that gonadal and adrenal steroid hormones alone or in combination stimulate the growth of type II pneumocytes. \*Allied Health Undergraduate Student, UMC

# THE EFFECTS OF THE ESTROGEN, PROGESTERONE, AND CORTISOL, ON THE VIABILITY AND PROLIFERATION OF THE CERVICAL TUMOR CELL LINE, SW 756, IN CULTURE

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Cervical cancer remains a major health threat to women worldwide and role of steroid hormones on cervical cancer cells is not clearly defined. This study investigated the effects of steroid hormones on the viability and proliferation of SW 756 cervical cell line. In this study, SW 756 cells were treated with physiological and supraphysiological of cortisol, estrogen, and progesterone. The cells were harvested at 24, 48, and 72 hours and cell numbers were determined. In addition, cellular damage, cellular protein content, and cellular morphological characteristics were determined at each time period and compared to a control. The data obtained from this investigation demonstrated the following: Cell counts revealed supraphysiological doses of cortisol, estrogen and progesterone caused marked decreases in cell numbers at 24 hours (p < 0.05), compared to the control. At 48 and 72 hours, decreases were still apparent for supraphysiological doses of cortisol and estrogen, while progesterone treated cells adapted. Assays for cell damage revealed marked cellular damage, at 24 hours following supraphysiological levels of progesterone (p < 0.05). Supraphysiological levels of cortisol and estrogen caused cellular damage at 24 hours and marked cellular damage at 72 hours (p < 0.05, Dunnett's test). Cellular protein levels were unremarkable; however they indicated cell viability at all time periods. Morphological changes were insignificant. This investigation provides significant information regarding the interrelationship between the steroid hormones cortisol, estrogen, and progesterone and the viability and proliferation of HPV containing SW 756 cells in culture. \*Clinical Health Sciences Graduate Student, UMC

# THE EFFECTS OF INSULIN-LIKE GROWTH FACTOR-1 ON A MG63 (OSTEOSARCOMA) CELL LINE

Laura Franklin\*, Michelle Tucci, Hamed Benghuzzi, George Russell, Ashraf Ragab, and Audrey K. Tsao, University of Mississippi Medical Center, Jackson, MS 39216

Growth hormone secreted by the pituitary gland stimulates the liver to produce Insulin-like Growth Factor-1 (IGF-1), which is believed to play a valuable role in building lean muscle mass, maintaining bone density, and protecting nerve cells. The purpose of this experiment was to examine MG-63 cells after treatment with low (1  $\mu$ g), medium (5  $\mu$ g) and high (50  $\mu$ g) doses of IGF-1. MG-63 cells, were plated onto a 24 well tissue culture plate at a density of  $1 \times 10^5$  cells per well. The experiment was designed to evaluate cell counts, MDA, protein levels, and the cell morphology after 24, 48, and 72 hour post incubation with IGF-1. IGF-1 stimulated cellular division as evidenced both morphologically as well as by an increase in cell numbers. There was inverse relationship between dose and cell number with the lower dosage of IGF-1 causing the most significant increase. Increases in MDA levels were seen at twenty-four hours in all treated groups. The increase was dose dependent with the highest dosage of IGF-1 yielding the highest MDA levels. No significant changes in cellular protein levels were found for the duration of the experiment. Morphological evaluation showed increased cellular division and prominent nucleoli for the duration of the experiment. This information suggests that IGF-1 has an anabolic effect on MG-63 and the effect is dose dependent with the lower dose being more effective, suggesting receptor mediated effects. \*Undergraduate Student, Mississippi College

# THE EFFECT OF ULTRAVIOLET RADIATION EXPOSURE TO FIBROBLAST CELLS

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Fibroblasts play an important role in healing and tissue damage repair. When there is tissue damage, fibrocytes are transformed into fibroblasts, which contains large amounts of organelles, which are necessary for the synthesis and excretion of proteins needed to repair the damaged tissue. The objective of this study was to determine the effect that ultraviolet radiation had on fibroblast cells and how well the fibroblasts responded to antioxidants in an attempt to prevent skin damage from the harmful UV rays of the sun. The cells were divided into control groups and treatment groups and evaluated after 24, 48, and 72 hours. The first treatment group were exposed to 45 minutes of ultraviolet radiation and evaluated for morphological damage using Image Pro Digital Analysis. The second group of cells were treated with antioxidants prior to and after exposure to UV radiation and evaluated. The results of this study showed significant findings. UV radiation produced dramatic changes and alterations in the cells such as pleomorphism, swelling, and mitosis as well as other changes.

Antioxidant treatment caused significantly less cellular damage pre and post treatment. However, further investigation is needed to determine an appropriate dose of antioxidants that will offer complete cellular protection from ultraviolet radiation.

# THE EFFECT OF AGONISTS AND ANTAGONISTS ON HEP-2 CELLS

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Androgens may play an important role in promoting the growth of laryngeal carcinomas. The aims of this investigation were to investigate the effects of (testosterone (T) and androstendione (AED)) in the presence of the anti-androgen, spironolactone (S), on Hep-2 cellular proliferation and damage after 24, 48, and 72 hours. Hep-2 cells were divided into six groups (n = 5) control, S, T, AED, S+T, and S+AED, respectively. The cells were harvested after each incubation period into two different fractions: suspended cells and adhered cells. Cell counts and cellular damage determinations were performed on each fraction. Analysis of variance was used to determine significance at  $p < 0.05$ . Data for cell counts revealed an interesting phenomenon between the two fractions. Adhered cells showed decreased cell numbers in the presence of S and T for 24–48 hours followed by a significant increase at 72 hours. Cells in the adhered fraction incubated in the presence of AED or AED +S were significantly lower for the duration of the experiment. However AED or AED + S treatment caused significant increase in cell number in suspended fraction for the duration of the experiment. All treatments after 72 hours showed a slight reduction in MDA levels indicating treatments did not cause cell damage. Overall, the data suggests the possibility of two populations of cells that respond differently to the AED. T had no significant effect on either cell fraction for the first 48 hours followed by a significant increase in cell number at 72 hours suggesting T may need to be converted enzymatically to the more potent androgen, dihydrotestosterone. \*Allied Health Undergraduate Student, UMC

# SEMIQUANTITATIVE MEASUREMENT OF CYTOKINE MRNA IN PERIPHERAL BLOOD MONONUCLEAR CELLS FROM HEART TRANSPLANT RECIPIENTS.

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Cytokines play a major role in the inflammation process and in specific immune responses triggered by alloantigens. Previous studies demonstrated that cardiac allograft rejection is associated with an individual's inflammatory cytokine gene polymorphisms. Based on these findings, it was

hypothesized that possession of specific cytokine alleles, for TGF- $\beta$ 1, IFN- $\gamma$  or IL-10 might be influential in predisposing the recipient to allograft rejection and/or tolerance. Because transplant patients have undergone immunosuppressive therapy, demonstration of the relationship between genotype/phenotype is not practical. Therefore, the relationship between cytokine gene polymorphisms and the level of cytokine production was tested in an in vitro assay, using the recipient's peripheral blood mononuclear cells (PBMCs) treated with phytohemagglutinin (PHA). We used the polymerase chain reaction to semiquantitatively measure changes in the amounts of messenger RNA from the TGF- $\beta$ 1, IFN- $\gamma$  and IL-10 genes in the PBMCs before and 48 hours after PHA treatment. A total of 10 recipients with known cytokine genotype profile were studied. No elevation in expression level of TGF- $\beta$ 1 was observed in resting or stimulated samples. The IL-10 was elevated after stimulation in the PBMCs from recipients with high producing genotypes. The IFN- $\gamma$  was 50% elevated in the PBMCs from recipients with high producing genotypes and in some patients even in low producing genotypes. In conclusion, because of the therapeutic effects of the immunosuppressant, the analysis of the mRNA, demonstrated in this study might not represent precise quantification of cytokines associated with cytokine genotypes. (Supported in part by NIGMS R25 GM50117).

#### ELECTROPHORETIC MOBILITY OF LDL USING MRC-5 FIBROBLASTS EXPOSED TO SEX HORMONES

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Several studies have shown that the oxidative modification of LDL is the key to the development of atherosclerotic cardiovascular disease. Although there is extensive evidence implicating the oxidatively modified form of LDL, the exact mechanisms by which LDL oxidation occurs is still unresolved. The objective of this investigation was to study the effects of LDL modification by MRC-5 fibroblasts exposed to sex hormones. MRC-5 fibroblasts were treated with low and high doses of LDL and exposed to estrogen and testosterone. Representative samples from each group were used for the determination of LDL modification using lipoprotein electrophoresis. Results from the lipoprotein electrophoresis revealed that the migration patterns of the treatment groups varied significantly from the native form of LDL. Results from this investigation indicate that LDL was modified during the incubation periods with estrogen, testosterone, and the MRC-5 cells. In addition, it was evident the MRC-5 cells have the ability to metabolize LDL. Further investigation is needed to determine the role of MRC-5 cells in LDL modification. \* Clinical Health Sciences Graduate Student, UMC

#### THE EFFECTS OF (-) EPIGALLOCATECHIN-3-GALLATE ON RHESUS MONKEY KIDNEY EPITHELIAL CELLS

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Currently, it is estimated that approximately \$5.1 billion dollars are spent annually on herbal supplements in the U.S. Herbal supplements have beneficial properties; however, these properties need to be clinically proven and any possible interactions need to be documented. The chemopreventative effects of green tea are contributed to its major polyphenolic constituent, (-) epigallocatechin-3-gallate (EGCG). EGCG has been shown to induce growth arrest and/or apoptosis in various cell lines. EGCG is thought to selectively inhibit growth of cancer cells without adversely affecting normal cells. The purpose of this study was to incubate Rhesus Monkey Kidney Epithelial cells (RMKEC) with various doses of EGCG (20, 2, 0.2, 0.002  $\mu$ M) and evaluate cellular viability and morphology after 24, 48, 72, and 96 hours. The cells treated with 20  $\mu$ M EGCG appeared in small clusters with more cytosol and large nucleoli in addition to hydrophobic swelling. In cells treated with 2 and 0.2  $\mu$ M EGCG the cells appeared in a honeycomb pattern with hyperchromatic nuclei. Several cellular regions within the honeycomb showed evidence of anucleation. Overall the cells appeared round and swollen. Cells treated with 20, 2, and 0.2  $\mu$ M EGCG resulted in lysed cells and/or anucleated with frothy cytoplasm. There were few normal cells present with 0.002  $\mu$ M of EGCG however, the cells appeared swollen, round, and anucleated. The data obtained suggests that normal epithelial cells, like cancer cells, are adversely affected by EGCG at concentrations ranging from 20–0.002  $\mu$ M.

#### CA242 COMPARED WITH TEN OTHER TUMOR ANTIGENS FOR THE SERODIAGNOSIS OF PANCREATIC CANCER

Wileen Cooksey<sup>1</sup>\*, Slobodanka D. Manceva<sup>1</sup>, Sabrina Bryant<sup>1</sup>, Margaret Jackson<sup>1</sup>, James T. Johnson<sup>1</sup>, Harold Schultze<sup>1</sup>, Shawn Clinton<sup>1</sup>, Kevin Beason<sup>1</sup>, Cynthia Wilson<sup>2</sup>, Debbie Fortenberry<sup>1</sup>, Cynthia Bright<sup>1</sup>, Helen Hua<sup>1</sup>, Jiarong Ying<sup>1</sup>, Paul Sykes<sup>1</sup>, Kay Hollifield<sup>3</sup>, Charlton Vincent<sup>3</sup>, and Margot Hall<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406; <sup>2</sup>University Medical Center, Jackson, MS 39216; and <sup>3</sup>Laurel Clinic for Women, Laurel, MS 39442

The fourth commonest cause of cancer deaths, pancreatic cancer (CA) is a serious health problem in the United States. Due to its non-specific early symptoms, pancreatic cancer is often not diagnosed until late stage disease when the prognosis is poor. A noninvasive early detection method would be clinically useful. This study's goal was the comparison of CA242 with ten other tumor antigens for diagnostic efficacy in pancreatic CA. Sera from 554 patients (16 pancreatic CA, 128 other GI CA, 216 other CA, and 195 non-CA) were assayed for the presence of tumor antigens and the results correlated with diagnoses established pathologically. Immunoassay test kits from Diagnostic Automation (CA242), Hybritech (CEA, CA195), Centocor/Fujirebio Diagnostics (CA125, CA19-9, CA72-4, CA15-3, CA27.29, Cyfra21-1), CIS

Biointernational (CA50), and Abbott (AFP) were used to test for the concentration of these antigens. Using the manufacturer's decision values the following diagnostic sensitivities were obtained for pancreatic cancer: CA242 66.7%, CA195 100.0%, CA19-9 66.7%, CA50 66.7%, CA125 40.0%, CA 27.29 40.0%, CEA 37.5%, CA72-4 31.3%, Cyfra21-1 26.7 %, CA15-3 26.7 %, and AFP 18.2 %. Diagnostic specificities were >75%. From these data we conclude that CA242 is useful for the diagnosis of pancreatic CA.

#### Mini-Symposium—Selected Topics II

Moderator: D. Olga McDaniel, University of Mississippi Medical Center

#### 2:30 Genomics to Health

D. Olga McDaniel, University of Mississippi Medical Center

#### 2:50 Genomics to Biology

Micheal Hebert, University of Mississippi Medical Center

#### 3:10 Genomics to Society

Elizabeth Heitman, University of Mississippi Medical Center and Vanderbilt University

#### 3:45 Podium Presentations—Session II

Moderator: Larry S. McDaniel, University of Mississippi Medical Center

#### 4:00 PURIFICATION OF RECOMBINANT PSpC

Marques Slaughter<sup>1,2,3\*</sup>, Lashondra Johnson<sup>1</sup>, Joseph A. Cameron<sup>2</sup>, and Larry S. McDaniel<sup>1</sup>, <sup>1</sup>University of Mississippi Medical Center, Jackson, MS 39216 ; <sup>2</sup>Jackson State University, Jackson, MS 39217; and <sup>3</sup>Hinds Community College, Raymond, MS 39154

*Streptococcus pneumoniae*, pneumococcus, is an important pathogen that causes disease worldwide. The pneumococcus has evolved different strategies to evade host responses including the capsular polysaccharide and surface proteins. PpC is a surface protein that binds human Complement Factor H (FH). FH is a serum protein that helps protect host tissue from Complement by regulating the deposition of Complement on host tissues. It appears that the pneumococcus binds FH on PspC to help this bacteria evade the Complement system. The purpose of our experiment was to purify PspC that has been expressed in *Escherichia coli*. *E. coli* was grown to late log phase in broth and induced to express recombinant PspC. Analysis of cultures demonstrated significant expression of PspC. We then purified the PspC using an affinity column. Fractions from the column were examined by SDS-PAGE to identify those fractions that contained PspC and to assess the purity of the protein. A Western blot confirmed the presence of PspC which reacted with FH. An ELISA was carried out to determine the reactivity of the purified protein. The specificity of the interaction of FH with the purified PspC was examined

by an inhibition assay. We demonstrated that the purified protein specifically interacted with FH. Currently this purified protein is being used in studies to produce monoclonal antibodies that are specific for PspC. (Supported in part by NIGMS Grant R25 GM50117).

#### 4:10 CHARACTERIZATION OF COLIFORM BACTERIA FROM INFLUENT WASTEWATER OF THE UNIVERSITY OF MISSISSIPPI WASTEWATER TREATMENT PLANT

Trisha Weekley\* and Al Mikell, University of Mississippi, University, MS 38677

Coliform bacteria are those bacteria used as an indicator organism in determining whether or not water has been contaminated. *Escherichia coli* is one example of coliform bacteria. It is one of the many bacteria that are a normal flora of the gastrointestinal tract of all warm-blooded terrestrial species. Its presence can be detected in the waste of these species. In this paper, wastewater samples were collected from the University of Mississippi Wastewater Treatment Plant in order to test for coliform bacteria found in humans. Specifically, bacteria having the characteristics of *E. coli* were selected for and tested. The bacteria were run through a series of tests to determine its identification. These tests included EC with MUG, gram staining, and API-20E test kit. After the identification of the samples using the API-20E test kits, there was found to be *Klebsiella*, *Enterobacter*, and unidentified bacterium. Why there was no presence of identified *E. coli* is still a part of ongoing research.

#### 4:20 PHOTOMUTAGENICITY OF A HAIR DYE INGREDIENT 3,3'-DICHLOROBENZIDINE (DCB)

William Hardy\*, Charity Mosley\*, Lei Wang, Jian Yan, and Hongtao Yu, Jackson State University, Jackson, MS 39217

*Salmonella typhimurium* bacteria strain TA 102 was used to examine the chemical toxicity, phototoxicity, and photomutagenicity of 3,3'-dichlorobenzidine (DCB), a chemical used in the production of pigments of hair dyes, paper, paint, rubber, leather, plastic, and other related industries. Up to a concentration of 625  $\mu$ M (160 mg/plate), DCB did not have chemical toxicity on TA 102. DCB is phototoxic for TA 102 when the bacteria is exposed to DCB and light at the same time. In a DCB concentration range of 125  $\mu$ M (32 mg/plate) to 625  $\mu$ M, DCB is phototoxic for TA 102 in a DCB dose dependent manner. Below 125  $\mu$ M, DCB is not phototoxic. Pre-incubation of DCB in the above concentration range with TA 102 followed by light irradiation (UVA, 6.5 J/cm<sup>2</sup> and visible light, 13 J/cm<sup>2</sup>) indicated a count of more than twice the revertant colonies of TA 102 as the negative control. This means that DCB is also photomutagenic. This research is supported by a grant from the National Institutes of Health (NIH-SCORE S06GM08047). We would like to thank the National Science Foundation for student support through LSMAMP and HBCU-UP STARGE programs.

#### 4:30 PNEUMOLYSIN INDUCED INFLAMMATORY RESPONSES FOLLOWING ANTIBIOTIC TREATMENT OF *STREPTOCOCCUS PNEUMONIAE*

Justin Thornton\* and Larry S. McDaniel, University of Mississippi Medical Center, Jackson, MS 39216

Pneumolysin (PLY) is an important virulence protein of *Streptococcus pneumoniae*. To examine the global effect of pneumolysin on cells of the immune system we used cDNA microarray analysis of human THP-1 cells exposed to *S. pneumoniae*. THP-1 cells were suspended in antibiotic free RPMI and co-incubated with either medium alone, capsular type 2 strain D39, or PLN, a Ply lacking isogenic mutant of D39. This allowed us to identify genes that were differentially regulated in response to pneumolysin. Since the cell wall of gram-positive organisms has been shown to lead to a potent inflammatory response, we hypothesized that pneumolysin played an additive role in this response. Human THP-1 cells were exposed to either D39 or a PLN in the presence of different antibiotics. THP-1 viability and bacterial cell counts were determined at 3 and 10 hours and supernatants were collected. Penicillin treatment resulted in a three log decrease in colony forming units of D39 and PLN at three hours. THP-1 cells exposed to D39 in the presence of penicillin had significantly higher levels of IFN- $\gamma$  than cells exposed to PLN. The viability of THP-1 cells remained above 70% for all exposures. We also examined the expression of cell adhesion molecules in response to pneumococci and pneumolysin using real time PCR. Our data suggest that specific antibiotic treatment of pneumococci results in pneumolysin release that can affect the subsequent inflammatory response.

### FRIDAY MORNING

Emerald

#### 9:00 Podium Presentations—Session III

Moderators: Robin Rockhold and Joseph Cameron, University of Mississippi Medical Center and Jackson State University

#### 9:15 EVALUATION OF THE CORIN/ANP SYSTEM IN TRANSGENIC HEART FAILURE MODELS

Kristina Vaughn\* and Guy Reed, Jackson State University, Jackson, MS 39217, and Harvard University, Boston, MA 02115

The high incidence of congestive heart failure is partially attributed to uncontrolled hypertension. The corin/ANP system is investigated in heart failure with respect to blood pressure and mortality. Atrial natriuretic peptides (ANP) possess the ability to lower blood pressure with vasodilatation and salt excretion once activated by corin. Previous data shows that this system is altered in heart failure models, with ANP expression increasing and corin expression decreasing. This difference in expressions may affect the overall illness. The mutated cAMP Response Element-Binding Protein, mCREB,

was used in transgenic mice to simulate the physiological effects of heart failure. Overexpression of corin was used in transgenic and wild type mice to determine the affect of corin on blood pressure. During blood pressure monitoring, mice were anesthetized and then catheterized. Mortality rates were generated from transgenic mice from mCREB and ANP knockout/mCREB mice, to determine the role of ANP in heart failure mortality. In the blood pressure study, there was no significant differences in blood pressure between genotypes ( $p>0.05$ ), while a difference was noted between heart rates of corin transgenic mice and wild type controls ( $p<0.05$ ) for the females. Mortality data showed a significant decrease in lifespan for both mCREB and ANP knockout/mCREB mice with a  $p<0.01$  for males and  $p<0.001$  for females for ANP knockout/mCREB mice. Results for the blood pressure study suggest that corin may not have a direct relationship to lowered blood pressure, while the mortality study demonstrates that ANP provides a protective benefit for congestive heart failure.

#### 9:25 CYTOKINE GENOTYPE POLYMORPHISM AND EXPRESSION CORRELATES WITH THE OUTCOME OF CARDIAC TRANSPLANTATION

Andrea Barker\*, Laura Godfrey, Brenda D. Mangilog, and D. Olga McDaniel, University of Mississippi Medical Center, Jackson, MS 39216

Coronary vasculopathy (CV) is a major factor in long-term survival of heart transplantation. The pathogenesis of CV in part is contributed by the activated immune response of the recipient to the donor tissue. Evidence supports the role of cytokines in the inflammatory and immune responses that mediate allograft survival outcome. To test this hypothesis, peripheral blood mononuclear cells (PBMCs) from heart transplant patients with varying degrees of CV and/or grade 3A rejections were tested for their capacity to express different inflammatory cytokines at the mRNA level using RT-PCR. Previously we have demonstrated that the IFN- $\gamma$  intermediate, IL-10 low and IL-18 high producer genotypes were associated with the occurrence of rejection episodes following cardiac transplantation. In this study, cDNA from the PBMCs were tested for the levels of mRNA transcript of the IFN- $\gamma$ , IL-10, and IL-18 by PCR. The IL-18 mRNA was elevated in the patients with mild to strong CV as compared with those without the CV. The level of gene expression for IL-18 correlated with the genotype assignment. The IFN- $\gamma$  expression level 70% was in agreement with the genotypes, but there was a stronger correlation between IFN- $\gamma$  high producing genotypes as compared with the intermediate or low producers. IL-10 expression was elevated after treatment with PHA, but this phenomenon was not observed in IL-18 genotypes. Analysis of such polymorphism in a greater number of patients might allow the identification of patients before transplantation who have a greater risk of developing graft rejection.

#### 9:35 SYNTHETIC ALKALOIDS FROM *SOLENOPSIS*

# INVICTA (IMPORTED FIRE ANT) VENOM EXERT CARDIOVASCULAR ACTIONS

George Howell\*, Jordan Butler\*, and Rob Rockhold, University of Mississippi Medical Center, Jackson, MS 39216

Two structurally verified, synthetic *S. invicta* venom alkaloids, solenopsin A (*trans*-2-methyl-6-undecylpiperidine) and its *cis*-isomer, isosolenopsin A, were synthesized. Both have been shown previously to inhibit nitric oxide synthase (NOS) isoforms *in vitro*, with isosolenopsin A showing IC<sub>50</sub>S of 18 ± 3.9 (neuronal NOS), 156 ± 10 (endothelial NOS), and >1000 μM (inducible NOS). Sprague-Dawley rats were anesthetized with isoflurane, paralyzed with gallamine, artificially ventilated and instrumented to record arterial blood pressure (BP; mm Hg), heart rate (HR; bpm) and left ventricular dP/dt (percent change from control; LVC; an index of cardiac contractile force). Solenopsin A elicited maximal percent changes (± S.D.; n = 5) of -40 ± 12 (BP), -27 ± 8 (HR) and -41 ± 17 (LVC). Isosolenopsin A (15 mg/kg, *i.v.*) produced responses similar to solenopsin A (30 mg/kg). In a single spontaneously breathing rat, solenopsin A (30 mg/kg, *i.v.*) caused respiratory arrest. Superfusion of a working, isolated perfused heart with solenopsin A elicited a marked, reversible decrement in contractile function (dP/dt) at 10 μM and cardiac arrest at 100 μM. No overt cardiovascular responses were identified in conscious, freely moving rats chronically instrumented to record BP and HR and given solenopsin A (30 mg/kg, *i.v.*). The results demonstrate that these alkaloids possess robust depressant activity on the cardiac and respiratory systems, actions that are not consistent with the demonstrated *in vitro* inhibition of NOS. (Supported by the Howard Hughes Medical Institute.)

## 9:45 IMMUNOLOGICAL RESPONSES TO CYTOPLASMIC ANTIGENS: ROLE OF MHC CLASS II ANTIGENS

Jeremy Lott<sup>1,2,\*</sup>, Delu Zhou<sup>1</sup>, Joseph A. Cameron<sup>2</sup>, and Janice S. Blum<sup>1</sup>, <sup>1</sup>Indiana University School of Medicine, Indianapolis, IN 46202, and <sup>2</sup>Jackson State University, Jackson, MS 39217

The Major Histocompatibility Complex (MHC) encoded class I and II molecules are expressed on the surface of cells and function to display peptides derived from pathogens as well as self proteins for recognition by host T lymphocytes. Typically, class I displays peptides from cytoplasmic proteins, while class II presents peptides derived from extracellular pathogens and proteins that have been delivered into lysosomes. This research is focused on a novel alternate pathway for class II molecules, specifically their ability to present peptides generated in the cytoplasm. The project was designed to address whether peptides in the cytoplasm can be transported directly into acidic vacuoles containing class II molecules. As an assay system, MHC class II<sup>+</sup> and MHC class II<sup>-</sup> B cells were used to monitor peptide transport from the

cytoplasm to vacuoles. Cells were electroporated to deliver labeled peptides into the cytoplasm. Western blots were performed to determine whether the labeled peptides had entered vacuoles to bind class II molecules. Studies demonstrated that only with delivery of peptides into the cytoplasm, could labeled peptides bind to class II. It is hoped that the results of this study will lead to novel insights concerning immune tolerance, and one day the development of new treatments for autoimmune diseases. (Supported in part by NIGMS R25 GM 067592).

## 9:55 SIGNAL TRANSDUCTION MECHANISM FOR VON WILLEBRAND FACTOR

John Kermode\* and Qi Zheng, University of Mississippi Medical Center, Jackson, MS 39216

High shear stress in an arterial stenosis causes von Willebrand factor (VWF) to interact with its platelet receptor, glycoprotein Ib-IX-V (GpIb-IX-V). Such interaction leads to platelet activation by a poorly defined mechanism that may involve calcium mobilization and protein tyrosine phosphorylation. The present study examined the responses of human platelets to VWF. Intracellular calcium concentration ([Ca<sup>2+</sup>]<sub>i</sub>) was assayed with Fura-PE3, platelet activation through serotonin secretion, and phospholipase A2 activity through measurement of thromboxane A2 generation. Treatment of platelets with the cyclo-oxygenase inhibitor aspirin abolished both the [Ca<sup>2+</sup>]<sub>i</sub> transient and platelet activation in response to VWF. The influence of various phospholipase A2 inhibitors on these responses was also examined. One inhibitor, oleyloxyethyl phosphorylcholine, completely abrogated the platelet responses to VWF, but did not affect responses to α-thrombin or collagen. In contrast, methyl arachidonyl fluorophosphonate suppressed the platelet responses to α-thrombin and collagen, but not those to VWF. Differential inhibition was confirmed with other phospholipase A2 inhibitors. These findings imply that VWF induces platelet activation by stimulating a phospholipase A2 distinct from the cytosolic calcium-dependent type IV isozyme. Treatment of platelets with tyrphostin A23, a broad-spectrum inhibitor of protein tyrosine kinases, abrogated VWF-induced thromboxane A2 generation and platelet activation. The latter observation suggests that a tyrosine kinase might be responsible for activation of the novel phospholipase A2 when platelets are stimulated with VWF. [Supported by the American Heart Association (Southeast Affiliate).]

10:05 Break



## Podium Presentations—Session IV

Moderators: Michelle Tucci and Jacqueline Stevenes, University of Mississippi Medical Center and Jackson State University

10:20 ANALYSIS OF CYP 3A4 GENOTYPE VARIATION IN RENAL TRANSPLANT RECIPIENTS AND THE ASSOCIATION WITH CYCLOSPORIN CLEARANCE

Sebron Harrison\*, Brenda D. Mangilog, W. Henry Barber, Laura Godfrey, Andrea Barker, Xinchun Zhou, Jeffrey Dolittle, and D. Olga McDaniel, University of Mississippi Medical Center, Jackson, MS 39216

Most organ transplant recipients in addition to immunosuppressive drugs such as cyclosporin, tacrolimus or prednisone also take medications for diabetes, hypertension and other conditions. Frequently, when more than 2 drugs are concomitantly administered there is good chance of alteration in drug distribution and excretion following long-term drug treatment. Such alteration might affect metabolism of many drugs. We have demonstrated interindividual variation in CYP 3A4 expression in different individuals. CYP 3A4 is found in most adults with 10 to 40 fold variations in the level of expression. Such variations are due to the polymorphism within the promoter region of the genes, causing variation in the level of expression. The aim was to determine the allelic frequency of the CYP 3A4 variants in African-American (AFAM) patients and to examine a possible association with cyclosporin elimination in the transplant settings. Blood samples from 77 AFAM patients and 67 matched controls were studied by single nucleotide polymorphism (SNP) and PCR. CYP3A4 G genotype was present in 82.5% of renal transplant patient population. There was no difference between G frequency in the patients as compared with control samples. Frequency distribution of G genotype was significantly higher in our study population (82.5%) as compared with AFAM (53%) elsewhere. There was a trend towards higher cyclosporin clearance index and AA variant, indicating that the effect of CYP3A4 might be more evident in a GG genotype. Such information might allow strategies for immunosuppressive drugs such as cyclosporin and tacrolimus that are commonly used to prevent allograft rejections.

10:30 PRIME-BOOST IMMUNIZATION WITH DNA AND PROTEIN ELICITS PROTECTION AGAINST PNEUMOCOCCAL INFECTION

Quincy C. Moore III\*, Joseph R. Bosarge, Xiangyun He, and Larry S. McDaniel, University of Mississippi Medical Center, Jackson, MS 39216

We have previously reported that immunization with the gene encoding the  $\alpha$ -helical domain of PspA/EF5668 or immunization with the purified recombinant protein can elicit protection against pneumococcal challenge in mice. In previous studies mice were immunized with 50 $\mu$ g *pspA* and challenged

with pneumococcal strain WU2 (100% protection) and EF5668 (43% protection). Cross-protection was observed but we wanted to modulate the immune response by using prime-boost immunizations. In this study, we examined the effect of priming with *pspA*/EF5668 and boosting with rPspA/EF5668. Mice primed and boosted with 50  $\mu$ g *pspA* had anti-PspA serum specific antibodies of 5.96  $\mu$ g/ml  $\pm$  1.45 and a survival rate of 89%. Mice primed with 50  $\mu$ g *pspA* and boosted with 10  $\mu$ g of PspA without adjuvant had anti-PspA serum specific antibodies of 1.75  $\mu$ g/ml  $\pm$  0.55 and a survival rate of 90%. In mice primed with 10  $\mu$ g of PspA without adjuvant and boosted with 50  $\mu$ g *pspA*, the concentration of anti-PspA specific antibodies was 3.63  $\mu$ g/ml  $\pm$  1.02 and there was a 70% survival rate. We have demonstrated that priming with DNA (*pspA*) leads to an enhanced response to PspA when mice are boosted with protein (PspA).

10:40 THE EFFECT OF FRUCTOSE-1,6-DIPHOSPHATE ON IL-1RA, IL-1 $\beta$ , IL-6 AND TNF $\alpha$  FROM LPS ACTIVATED MACROPHAGES

Jay Wentworth\*, Hari H.P. Cohly, Joe Lopez, John J Jenkins, and Angel K. Markov, University of Mississippi Medical Center, Jackson, MS 39216

Fructose 1,6-diphosphate (FDP) is a naturally occurring intracellular metabolite, which has been demonstrated to inhibit endotoxin shock in vivo. We wanted to determine the *in vitro* role of FDP on the mRNA expression of IL-1Ra, IL-6, IL-1 $\beta$  and TNF- $\alpha$ , lipid peroxidation and iNOS production in monocytic mouse cell line RAW 264.7 using LPS. RAW 264.7 cells were incubated for 20 hrs at 37  $^{\circ}$ C, 5% CO<sub>2</sub> with LPS at 10 ng/ml. Then, cells were tested with decreasing concentrations of FDP (5000  $\mu$ g/ml to 5  $\mu$ g/ml) and Cyclosporin (500 ng/ml, to 0.5 ng/ml), for iNOS production, lipid peroxidation, and cytokine expression. Cells were plated in T-flasks to confluence and were then treated with 10 ng/ml of LPS. After 18–20 hr, the cells were treated with trypsin-EDTA, centrifuged at 12,000 g for 5 min and 100  $\mu$ l of the supernatant was removed and mixed with equal volumes of Greiss reagent to determine iNOS production. In addition, 500  $\mu$ l of the supernatant was mixed with equal volumes of thiobarbituric acid to determine lipid peroxidation. RNA was extracted from cell pellets using trizol, then was analyzed by a spectrophotometer, and the RT-PCR was performed for the evaluation of IL-1Ra, TNF- $\alpha$ , IL-6 and IL-1 $\beta$ . Preliminary results show that LPS was non-stimulatory for lipid peroxidation and iNOS production. TNF- $\alpha$  activity was undetectable. IL-6 and IL-1Ra showed a dose response correlation at FDP concentrations of 500  $\mu$ g/ml, 250  $\mu$ g/ml, and 100  $\mu$ g/ml. These preliminary results present the possibility that FDP influences IL-6 and IL-1Ra mRNA expression.

# 10:50 EFFECTS OF PFT $\alpha$ (PIFITHRIN- $\alpha$ , P53 INHIBITOR) ON CELL SURVIVAL AND TRANS-ACTIVATION OF KNOWN P53 RESPONSIVE GENES USING RAT LIVER CELLS AND HEPG2 CELL LINE

Ibrahim Farah\* and Rowshan A. Begum, Jackson State University, Jackson, MS 39217

Pifithrin- $\alpha$  (PFT- $\alpha$ ) is a reversible inhibitor of down stream function of p53. Responding to genotoxic agents, normal cells are instructed by p53 to either perform DNA repair or to commit suicide. Chemo and/or radiotherapy damage both normal and cancerous cells indiscriminately. The objective therefore, was (1) to evaluate PFT- $\alpha$  for differential protection in response to arsenic trioxide and cadmium chloride exposure of normal and neoplastic cells, and (2) to evaluate the transcriptional activation of p53 and p53-responsive genes in rat liver cells and HepG2 carcinoma cell line. Cells were cultured to 90% confluency and subsequently exposed to cytotoxic agents in presence or absence of PFT- $\alpha$  (10  $\mu$ g/ml) for a 24 hour period. Cell survival was detected by fluorospectroscopy (FDA). Percent survival indices (LC50) were calculated using regression analysis. Mean LC50 and (SD) for HepG2 cells following exposure to arsenic were 13.7 ( $\pm$ 1.0)  $\mu$ g/ml with PFT- $\alpha$  and ( $\pm$ 2.5)  $\mu$ g/ml with PFT- $\alpha$  and 573.15 ( $\pm$ 1.0)  $\mu$ g/ml without PFT- $\alpha$ ; ( $p$ <0.5). With rat liver cells exposed to cadmium chloride the LC50 was found to be 57.72 ( $\pm$ 0.8) and 58.1 ( $\pm$ 5.5)  $\mu$ g/ml; ( $p$ >0.5), in presence of PFT- $\alpha$  and in its absence respectively. Significant differences from controls upon exposure to arsenic trioxide in presence and absence of PFT- $\alpha$  were only seen in rat liver cells. PFT- $\alpha$  inhibited the trans-activation of p53 in rat liver cells and resulted in repression of bc12, PCNA, mdm2, cyclin G and p21 genes in response to arsenic. HepG2 cells exposed to arsenic trioxide and PFT- $\alpha$  showed extensive expression p53 and PCNA.

# 11:00 THE CONTRIBUTION OF IFN- $\gamma$ AND IL-18 GENOTYPE POLYMORPHISM TO THE ALLOGRAFT FUNCTION IN AFRICAN-AMERICAN RENAL TRANSPLANT RECIPIENTS

Xinchun Zhou\*, W. Henry Barber, Donald E. Butkus, Larry S. McDaniel, Brenda D. Mangilog, and D. Olga McDaniel, University of Mississippi Medical Center, Jackson, MS 39216

It was hypothesized that a high producing IFN- $\gamma$  allele might be influential in predisposing the recipient to allograft rejection and the IL-18 cytokine genotype might play an important role in the induction of IFN- $\gamma$ . Thus, the purpose of this study is to characterize the IL-18 genotype, in relation to IFN- $\gamma$  production and the outcome of allograft function in kidney recipients. Cytokine gene polymorphism were evaluated in 76 African-American patients who undergone renal transplantation. The frequency distribution of cytokines were analyzed in respect to the clinical characterizations, including delayed graft function (DGF), rejection episodes (REs) and stable graft function (SGF). We have shown that the IFN- $\gamma$  T/A

intermediate producer genotype was associated with allograft rejection (50% in REs, 20.5% in SGF,  $p$  < 0.01, RR = 0.4), whereas the IFN- $\gamma$  low producer genotype was significantly protective of the allograft (38.5% in REs and 74.4% in SGF,  $p$  < 0.005, RR = 2.85). The IL-18 CA/GC intermediate producer genotype was found in a higher frequency in recipients with REs as compared with SGF and controls (38.5%, 15.4%, and 23.4%, respectively). A combined effect of IFN- $\gamma$  T/A and IL-18 CA/GC genotypes was observed in seven recipients with REs, and was absent in recipients with SGF ( $p$  < 0.001). These finding support a role for IL-18 induction of IFN- $\gamma$  and might provide better understanding of the posttransplantation cytokine release and the management of allograft survival.

# 11:10 DEVELOPMENT OF A NOVEL IMAGE GUIDED TECHNIQUE FOR THE ASSESSMENT OF OSTEOGENESIS USING A RAT MODEL WITH INDUCED BONE TRAUMA IN PRE-CLINICAL MODE

Rishi Roy\*, Michelle Tucci, Ramesh Patel, Ashraf Ragab, George Russell, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Evaluation of osteogenesis following surgically induced and immobilized fractures in laboratory animals over a period of time in a sequential fashion often involves enrollment of a large number of animals. A certain number of animals have to be periodically sacrificed to adequately assess the progress of the experiment. The goal of this project was to explore the feasibility of using imaging technique as a tool to serially evaluating surgically induced femoral fractures in a rat model. Adult male rats were ( $n$  = 50) were divided into experimental (5 mm femoral segmental defect [FSD], and FSD plus Delivery Capsules), and control groups. All surgical procedures were conducted following IACAUC approved protocol. Live animals were subjected to imaging setting following anesthesia (Xylazine, 10 mg/kg; Ketamine, 75 mg/kg). Digitized data were generated by rotating head angiographic unit as well as a multi-slice Computerized Tomographic scanner with helical method and processed in dedicated computer systems with algorithms to reconstruct 3-dimensional images in various angles with the capabilities of subtracting overlying soft tissues or bones. The radiographic findings [3-dimensional mode] were analyzed for definition of the immobilizing hardware, appearance of the fracture sites, proximity and appearance of the implanted bone-growth enhancing delivery capsules contiguous to the fracture sites. Results of this project suggest that (I) the use of imaging methods may offer an advantage by reducing the number of animals that have to be involved in the experiment, and (II) the use of imaging methods could provide an accurate assessment of the status of the healing process (termination of treatment vs additional treatment) without sacrificing the animals (predicting prognosis). \*Undergraduate Student Award Category Competition




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## FRIDAY AFTERNOON

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### Gulf Hall

1:00–2:15 Workshop on CPR (Family and Friends)  
Martha Howard, Karen Bell, and Chris Powell, University of Mississippi Medical Center, Jackson, MS 39216; American Heart Association, Mississippi Chapter, Hattiesburg, MS; and AMR, Gulfport, MS

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## FRIDAY AFTERNOON

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### Emerald

#### Special Symposium

#### GIS and Remote Sensing in Health Sciences

Organized by: The University of Mississippi Medical Center

Geospatial information technology, such as GIS and Remote Sensing, provide powerful analytical, visual, and operational tools for understanding of our world. The complex analysis of the intersection of environmental, economic, political, medical, and social conditions that affect our well-being is one of the many benefits of such tools. As health organizations strive to meet the demands of a resource-constrained world, the use of GIS in service logistics has taken on even greater value. Such technology has been a key factor in developing intelligent solutions that help health professionals eradicate and control infectious disease, allocate scarce government and private resources, and increase the efficiency of the resources that are available

Mississippi is a leader in applying GIS and RS in many areas, including health. This year, as an academic partner of NASA, UMMC hosted two collaborative meetings between NASA and CDC with aims of exploring efficient utilization NASA's technology in studying diseases, particularly vector-borne diseases, as well as in tracking public health environmental factors. This proposed mini-symposium will provide an opportunity for a wide group of audience from this state to hear national experts, which hopefully will enhance a broader collaboration in Mississippi.

1:00 Welcome and Introduction  
D. Olga McDaniel and Hamed Benghuzzi, University of Mississippi Medical Center

1:05 Speakers' Introduction  
Faruque Fazlay, Director of GIS, University of Mississippi Medical Center

1:15 William Davenhall  
Manager, Health and Human Services Solutions Group ESRI, Inc., Redlands, California

2:00 Dr. Frances J. Mather  
Assistant Dean for School of Public Health and Tropical Medicine Tulane University

2:25 Break

2:35 Dr. Robert A. Venezia  
Program Manager for Public Health Applications, NASA Headquarters

3:00 Dr. Tim Orsi  
Project Coordinator-Harmful Algal Blooms Observing System (HABSOS); NOAA National Coastal Data Development Center (NCDDC)

3:25 TBA—Stennis/ATSDR

3:50 Dr. David Dzielak  
Associate Vice Chancellor for Research, University of Mississippi Medical Center

4:05 Health Sciences Division Business Meeting, Election of New Officers, and Awards

4:30 Meeting Adjourns

### HISTORY AND PHILOSOPHY OF SCIENCE

Chair: S. Kant Vajpayee, University of Southern Mississippi

Vice-chair: Robert Hamilton, Mississippi College

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## THURSDAY MORNING

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### Atlantic

9:30 THE SCIENTIFIC CONTRIBUTIONS OF THE ARTS FACULTIES AT THE UNIVERSITIES OF PARIS AND OXFORD IN THE 14<sup>TH</sup> CENTURY  
Michael Fitzgerald, Independent Scholar, Hattiesburg, MS 39401

The presentation is primarily a historical discussion of the scientific contributions of the 14<sup>th</sup> century Arts Faculties at the Universities of Paris and Oxford, to early modern theories of Logic, Kinematics, and Dynamics. In particular, I shall discuss the contributions of the groups referred to as the Mertonian "Calculators" and the Parisian "Nominalists."

## 10:00 EDWIN J. COHN'S CONTRIBUTIONS TO TRANSFUSION MEDICINE

Carolyn Beck, University of Southern Mississippi, Hattiesburg, MS 39406

During World War I the majority of casualties were not caused by direct injury but rather by blood loss. As another world war approached in the late 1930s, a major challenge to medicine was the need for a blood product to stem shock until whole blood could be obtained. Such a product must have a useful shelf life, be easily transported to battlefields and be available in large quantities. Harvard biochemist Edwin J. Cohn was challenged by the problem and began experiments to determine methods to fractionate blood components. Cohn envisioned the production of each component in a concentrated form for use in surgery and medical treatments. The field of protein chemistry was in its fledgling years when Cohn undertook the complex project of fractionating blood plasma. The separation process developed by Cohen and collaborating scientists is today called cold fractionation as it consists of a series of precipitation steps using salts and alcohol at cold temperatures. The immediate impact of Cohn's work led to the purification of serum albumin for the treatment of shock and burns. Commercial plasma laboratories rapidly adapted the Cohn cold fractionation process and produced more than 2 million units of albumin before the end of the war in 1945. Albumin, as time would reveal, was only the tip of the iceberg that emerged from the cold fractionation process.

10:30 Divisional Business Meeting

## 10:45 NEW ORLEANS BATTLES THE PLAGUE, 1914-20

L. Margaret Barnett, University of Southern Mississippi, Hattiesburg, MS 39406

Between 1906 and 1914, the New Orleans city government spent over \$20 million on sanitary engineering, expecting to revise the city's image as one of the dirtiest and unhealthiest places in America. At a meeting held in April 1914, state and local officials agreed that the work had been a resounding success. Only two months later, however, the city was in the throes of a public health crisis that revealed how insanitary New Orleans still was. Two residents of the Volunteers of America home on St. Joseph Street had come down with plague, and more cases soon followed. The disease was being spread by the millions of rats that infested the city. The US Public Health Service directed the anti-plague program, but it took years of rat-catching and rat-proofing to render the city officially plague-free. While the epidemic was small in comparison with the one that occurred earlier in San Francisco, it was the first to appear on the US Gulf Coast. This paper would be illustrated with photos. Research locations include the National Archives and the National Library of Medicine (both in Washington, DC), the New Orleans Public Library, Tulane University, and other regional archives.

## 11:15 SCIENCE UNDER HOUSE ARREST

S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406

The term house arrest, unfamiliar to many living in a democracy, is a milder form of punishment, meted out to those refusing to toe the establishment line. It is a means of suppressing the opposing voices. Military dictatorships and totalitarian regimes have used—and continue to use—this mode of control. House arrest limits the freedom of those arrested, but is not as bad as imprisonment. The hypothesis of this presentation is that science—and by way of association its practitioners—can suffer from the constraints of house arrest if the public policy makers are not careful. In the past, several philosophers of the tangibles—called scientists today—lost their lives for sticking to what they thought were truths. Some fortunate ones were put under house arrest or forced to emigrate. The history is punctuated with such punishments. Is science free in a society like ours? We would like to say yes. But many a times, science does suffer from house arrest even here—though scientists rarely do. Theoretical scientists such as those at the universities may figuratively suffer house arrest when taxpayers' research dollars are allocated with an eye on commercial potential. Recent focus by the National Science Foundation and other government agencies such as NASA to fund as per their list of priorities, rather than as per the open and free minds of university science researchers, is putting science under house arrest.

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THURSDAY AFTERNOON

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Atlantic

## 1:00 UNDERSTANDING ISSUES IN SPECIES ONTOLOGY

Kenneth J. Curry\* and Paula J. Smithka, University of Southern Mississippi, Hattiesburg, MS 39406

The ease with which we group similar organisms into biological species and the sense of assurance we feel about the existence of some entity we call "species" stands in marked contrast to the problems that arise in any attempt to understand the nature of species or even to determine whether they exist at all. Here we evaluate recent contributions to the thirty-year debate over species-as-individuals where a species is considered philosophically to be an individual composed of organisms that share some degree of integration and a common history or lineage. Some understanding of the issues at stake include consideration of properties ascribed to the whole individual such as not having instances, being spatiotemporally restricted, being concrete, not functioning in laws, lacking defining properties, and being ontologically autonomous (Ghiselin, 1997, *Metaphysics and the origin of species*, SUNY Press). Contrasted with this are properties that address connections among the parts such as causal integration and connections established through a common history. Understanding the birth and death of a species is especially problematic. Casting

species as individuals does not privilege cladogenesis. Character fixation during anagenesis is a reasonable alternative, but assumes that character evolution is the primary phenomenon of interest. Between birth and death we can profitably explore the concept of time-delimited slices (synchronic species) comprising a diachronic species passing through time and contrast this with the idea that time is an integral part of an individual species. In this latter sense the species does not pass through time but exists as part of the framework of time and space.

1:30 WHAT IS AN INDIVIDUAL?: LINGUISTIC AND ONTOLOGICAL CONFUSIONS REGARDING THE NATURE OF ORGANISMS AND SPECIES

Paula J. Smithka\* and Kenneth J. Curry, University of Southern Mississippi, Hattiesburg, MS 39406

The Species-As-Individuals (S-A-I) thesis has created a flurry of discussion concerning the nature of an individual. Exactly what is an individual? Suddenly, philosophers and biologists seem confused. For example, Jack Wilson has recently published a book entitled *Biological Individuality* (Cambridge U Press, 1999) which attempts to sort out the relationships between a 'particular,' an 'individual,' and an 'organism' and Stanley Salthe is concerned to specify the criteria for being an 'entity' (*Evolving Hierarchical Systems*, Columbia U Press, 1985). Furthermore, Wilson contends that there are different sorts of individuals: genetic individuals, functional individuals, developmental individuals, and historical entities/individuals. It is our contention that this much-ado-about individuals is a result of confusing linguistic conceptions with ontological ones. Grammatical individuals need not be ontological individuals; they are not necessarily extensionally equivalent. In this presentation we explore how these confusions arise within the context of organisms and species. We contend that the S-A-I thesis has turned the real ontological concern regarding the nature of species on its head. The real issue is how to generate and identify kinds, not individuals.

2:00 Break

2:15 TIME TO FACE REALITY: THE UNREALITY OF TIME COULD VERY WELL BE REAL

Michael Dodge, University of Southern Mississippi, Hattiesburg, MS 39406

Without doubt, Time has been one of the most discussed topics in the history of philosophy and science. From Greece's Chronos to modern atomic clocks, what could be more fundamental for human experience than keeping the time? This presentation will attempt to tackle the ontological status of time, articulating a two-pronged approach that should force the realist (with respect to time) to admit that presuming that time is a real thing is, at the least, an uncertain position. Most scientists are realists as regards time's existence, and they use time to understand fundamental enterprises ranging from standard kinematics to space-time metaphysics. Indeed, many

physicists now argue that time is a real component of the universe, but that it is stationary rather than flowing. This new understanding of time avoids some of the confusion created by maintaining that time "flows." Nevertheless, I shall show that neither time as a passing thing nor time as a stationary thing stands without criticism from anti-realist arguments. The ideas of numerous scientists and philosophers—most notably J. Ellis McTaggart—and some physicists—namely Julian Barbour—are critical here. While disagreeing on the reasons, both maintain one startling position: Time, at least as we commonly conceive of it, is unreal.

2:45 THE ANALYZATION OF THE REALISM/ANTI-REALISM DEBATE CONCERNING THE AREA OF SCIENCE

Derrick W. Leonard, University of Southern Mississippi, Hattiesburg, MS 39406

The debate of realism versus anti-realism has divided many philosophers of science for years. The object of this paper is to critically analyze the debate between realism and anti-realism concerning science. Realists believe that the matter of scientific research and scientific theories exists independently of our knowledge of it. The realists also believe that the goal of science should be the description and explanation of both observable and non-observable aspects of the world. Anti-realists think that realism only promises theoretical knowledge, but does not deliver what it promises. Realists such as Boyd, Hacking and Laudan approach their realists' point of view from different aspects but fundamentally believe in the core concepts of realism such as: (1) "Theoretical terms" should be thought of as putatively referring expressions; scientific theories should be interpreted "realistically." (2) Scientific theories, interpreted realistically, are confirmable and in fact often confirmed as approximately true by ordinary scientific evidence interpreted in accordance with ordinary methodological standards. (3) The historical progress of mature science is largely a matter of successively more accurate approximations to the truth about observable and non-observable phenomena. Later theories build upon the knowledge of previous theories. (4) The reality which scientific theories describe is largely independent of our thoughts or theoretical commitments. (Boyd) Anti-realists such as Kuhn, Van Fraassen, and Carnap tend to refute these concepts. Van Fraassen agrees with the first concept but argues against the rest. At the conclusion of this paper I shall analyze both sides of the debate and show which position is more plausible concerning science.

3:15 Break

3:30 STEPHEN J. GOULD'S NOMA PRINCIPLE AND THE SOCIAL ROLE, LIMITS, AND SCOPE OF SCIENCE

Malachi Martin, University of Southern Mississippi, Hattiesburg, MS 39406

The purpose of this study is to provide a philosophical analysis of a uniquely American social controversy, namely the creation-evolution conflict, and to furnish fresh epistemological grounds for resolving the conflict by appeal to the late Stephen Jay Gould's NOMA Principle. As Gould argues, the creation-evolution social controversy in America is predicated upon misconceptions about the nature, limits, and scope of science and scientific methodology. While philosophers of science such as Robert Pennock and Phillip Kitcher have sufficiently addressed the empirical claims emanating from creation science and ID proponents, the public controversy over 'origins' continues. After two and a half years of analyzing and researching the controversy, primarily from a philosophical perspective, I have come to the conclusion that the controversy is socio-cultural in nature, it is rooted in misconceptions about the methodology of science, and it can be resolved only through a reexamination of the role of science and religion in society.

#### 4:00 ROGER BACON: A MEDIEVAL THEORY OF PERCEPTION AND MEMORY

Linda M. Englade and Malachi Martin, Hinds Community College, Vicksburg, MS 39180, and University of Southern Mississippi, Hattiesburg, MS 39406

This historical study will focus on the work of Roger Bacon, a thirteenth century philosopher of science. Bacon, a Franciscan, was interested in both the philosophical material he learned during his tenure at the University of Paris, and in the scientific application of such material. As Bacon was particularly interested in optics, this essay will focus on his theory of perception and its links to memory. It will attempt to situate him relative to the other perceptual theories of the time and relative to the greater history of mind.

#### MARINE AND ATMOSPHERIC SCIENCES

Chair: Chet Rakocinski, University of Southern Mississippi

Vice-chair: Charlotte A. Brunner, University of Southern Mississippi

### THURSDAY MORNING

#### Deer Isle

9:30 Introduction

9:45 AN ANALYSIS OF AVERAGE 8 HR MAXIMUM OZONE CONCENTRATIONS ACROSS MISSISSIPPI

Kentave Green\*, Rematta S. Reddy, and Elgenaid Hamadain, Jackson State University, Jackson, MS 39217

On days when ozone levels approach unhealthy

conditions it is termed Ozone Action Day (OAD). The EPA defines OAD as one in which the concentration exceeds 85 ppb. We defined OAD as one in which the concentration exceeds 64 ppb. Twelve meteorological parameters were analyzed to determine their influence to induce an OAD across Mississippi. Ozone concentrations were collected daily from the MS Department of Environmental Quality (MDEQ) from fourteen sites. Meteorological parameters including: surface winds, transport winds, mixing height and ventilation were collected and analyzed. Data was retrieved from Jackson, Memphis and New Orleans National Weather Services (NWS) Fire Weather Forecast that cover the state. Statistical analysis using SAS combined with meteorological synoptic patterns of the period was performed to provide clearer insight into the general conditions influencing OAD. The regression models fit the data well ( $R^2 = 70\%$ ). No parameter significantly influenced ozone in 2002. But, for 2003 and 2002/2003, transport wind speed was the most significant parameter influencing ozone concentration. This suggests that ozone is being advected to other areas to influence local concentrations. Data suggest that transport winds from the SE at 9 mph would have the greatest influence on ozone concentration during September, but this cannot be inferred without reference to the dominant synoptic feature that prevail across the state. Ventilation and transport wind direction have correlated strongly with ozone concentration to induce an OAD. Average 8hr concentrations for 2002, 2003, and 2002/2003 were approximately 10% below the EPA attainment standard.

#### 10:00 GEOLOCATING MARINE BUOYS IN A FULLY IMMERSIVE 3D BATHYMETRIC ENVIRONMENT

Christopher A. Brown\* and Georgios Demetriou, University of Southern Mississippi Gulf Park, Long Beach, MS 39560

We have developed a C++ application with the OpenGL API that can geolocate objects in a fully immersive 3D environment. The program runs on a RAVE II visualization platform driven by a cluster of PCs. The geolocation algorithm utilizes the latitude/longitude position of the buoys. Our current application is located in the Gulf of Mexico and utilizes 5 minute bathymetric data on a beta-plane. The bathymetric data was provided by NAVO, and the Marine buoy location data was courtesy of NDBC.

#### 10:15 ON THE INFLUENCE OF THE PACIFIC/INDIAN OCEAN PRESSURE DIFFERENCE ON THE INDONESIAN SEAS CIRCULATION

Vladimir M. Kamenkovich\* and William H. Burnett, University of Southern Mississippi, Stennis Space Center, MS 39529, and Naval Meteorology and Oceanography Command, Stennis Space Center, MS 39529

A barotropic, non-linear, high-resolution ocean model operated with seasonally varying transports through four open ports is used to analyze the roles of some important physical

factors that control the Indonesian Seas circulation; specifically the Pacific-Indian Ocean pressure difference. Experiments with and without local wind forcing show that the model is able to replicate horizontal circulation patterns identified by previous modeling and observational studies. Dynamical analyses suggest that the geostrophic relation is applicable over a majority of the Indonesian Seas area and that the bottom topography is important in controlling the circulation. A detailed analysis of the integral momentum and energy balances for the Indonesian Seas area suggests that the total transport of the Indonesian Throughflow does not depend exclusively on the Pacific/Indian Ocean pressure difference but on other factors, including local winds, bottom form stress and the pressure forces acting on the internal sides. However, based on the results from a series of numerical experiments, we have found that the seasonal variations of the total transport of the Indonesian Throughflow are in phase with the pressure head variations. This supports the Wyrtki hypothesis on the correlation between the sea surface elevation difference at Davao, Philippines, and Darwin, Australia, and the total transport of the Throughflow.

#### 10:30 AN ERROR MODEL FOR A BAROTROPIC OCEAN MODEL

A. Louise Perkins<sup>1\*</sup>, Farnaz Zand<sup>1</sup>, and Gregg Jacobs<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Naval Research Laboratory, Stennis Space Center, MS 39529

We present a novel Taylor Series based study of the error terms that arise in a Finite Differenced Numerical Ocean Model on a given Numerical Grid. Specifically we formulate a way of studying the Grid Truncation Errors. The Taylor Series approximations used to derive Finite Differenced Numerical Approximations are typically chosen term by term, without a formal review of the impact of each approximation on the remaining terms. When these cross terms are benign, the effect is negligent. However, these cross terms can seriously impact the numerical solution on some numerical grids and not others. Our method allows us to study the grid impact on the errors in a concise way, providing guidance for both creating new models and interpreting the data from existing models.

#### 10:45 GLOBAL AND GULF OF MEXICO CLIMATOLOGICAL TELECONNECTIONS MAY INFLUENCE FISHERIES

Guillermo Sanchez<sup>1\*</sup>, Harriet M. Perry<sup>1</sup>, and Patricia Biesiot<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

Data from the National Data Buoy Center were used to calculate monthly averages of sea surface temperature (SST) and sea level pressure (SLP) from 27 buoys located in the northern Gulf of Mexico (nGOM). Statistical analyses showed it was possible to create single data sets of SST and SLP for the study area, which were then used to calculate SST and SLP

anomalies for the nGOM. To examine teleconnections between worldwide and regional climatological patterns, global data sets (obtained from the International Research Institute) and the nGOM data sets were subdivided into four sets by season and correlation analyses were performed. The SLP anomaly from the nGOM showed high correlation coefficients in winter with SST and SLP data sets from the Pacific Ocean tropics, in summer with the Eastern Pacific Oscillation, and in spring with the North Atlantic Oscillation. The SST anomaly from the nGOM showed high correlation coefficients in winter with SST and SLP data from the Pacific and Atlantic Oceans and in spring with SST in the West Pacific. Highly-correlated SST and SLP global data sets will be correlated with long-term SEA-MAP trawl survey data from the National Marine Fisheries Service to examine the effects of those climatological events on distribution and abundance of selected fish species in the nGOM.

#### 11:00 SUMMERTIME OCCURRENCE OF REEF FISH LARVAE IN THE GULF OF MEXICO

David Hanisko\* and Joanne Lyczkowski-Shultz, University of Southern Mississippi, Stennis Space Center, MS 39529, and National Marine Fisheries Service, Pascagoula, MS 39568

Ichthyoplankton samples were collected over natural reefs throughout the United States Gulf of Mexico (USGOM) and from non-reef sites over the Texas-Louisiana (TX-LA) shelf during Southeast Area Monitoring and Assessment Program surveys in the summers of 1992 and 1993 to characterize the occurrence and abundance of reef fish larvae. The larvae of 11 core reef families composed 6% of total abundance from reef sites throughout the USGOM. However, larval reef fish abundance varied greatly among regions of the USGOM. Larvae of the reef families accounted for less than 2% of total abundance in the western USGOM, but accounted for 11% in the eastern USGOM. Over the TX-LA shelf a similar pattern emerged. Larvae of reef families accounted for 0.2%, 0.4%, and 1.2% of total abundance respectively for the inner, middle and outer TX-LA shelf. Distributions across the TX-LA shelf of lutjanid and labrid larvae were quite different in 1992 and 1993. Inter annual differences in shelf hydrography related to freshwater discharge of the Atchafalaya and Mississippi Rivers explained much of the observed variation in the cross-shelf distribution of these larval reef fishes. The distinct differences in the larval occurrence and abundance of these core reef families are linked to large regional differences in the amount of reef habitat, the location of reef habitat, and in the north-western USGOM inter annual differences in shelf hydrography.

# 11:15 USE OF LOCAL COASTAL VEGETATION FOR FUTURE RESTORATION OF SALT MARSHES

Heather R. Foster<sup>1\*</sup>, Tiffany L. Smith<sup>1\*</sup>, Cynthia A. Moncreiff<sup>2</sup>, John D. Caldwell<sup>2</sup>, and Charles H. Flowers, Jr.<sup>2</sup>, <sup>1</sup>Mississippi Gulf Coast Community College, Jackson County Campus, Gautier, MS 39553, and <sup>2</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

Black needlerush (*Juncus roemerianus*) and smooth cordgrass (*Spartina alterniflora*), the two most common coastal Mississippi salt marsh plant species, are extremely sensitive to anthropogenic disturbances and minor changes in soil elevation, which can lead to marsh loss. Obtaining plants for restoration requires destruction of existing marsh or importation of non local material. Use of propagated native plants allows for restoration without introducing plants that have little to no genetic variation or may not be adapted to the local climate. Seeds for both species were collected and approximately 1,200 *J. roemerianus* plants and 4,000 *S. alterniflora* plants were/are in propagation. All plants have been grown from seeds collected from 50 to 200 individual plants of each species in the vicinity of Ocean Springs, MS. A second round of collection and propagation of *J. roemerianus* occurred/is occurring in the winter of 2003. Germination and survival rates for both species are relatively high, and we anticipate this growth situation to continue. Overall plant survival and mitigation project success should be improved by using local plant material that is better able to survive local environmental conditions.

# 11:30 ENTOMOLOGICAL SURVEY OF THE OLD FORT BAYOU MITIGATION SITE

Jennifer I. Ford\* and George Ramseur, Mississippi Gulf Coast Community College, Jackson County Campus, Gautier, MS 39553, and The Nature Conservancy, Ocean Springs, MS 39564

This project included a basic entomological survey of the Old Fort Bayou Mitigation Site in order to observe various insect life present on the property. This project focused primarily on the aquatic and larval stages of insects, with greater emphasis on the variety of insects present than the relative populations. Specimens were temporarily trapped, photographed, then released; the photographs were used to identify the insects. No entomological survey has been previously attempted on the mitigation site; therefore, the various areas of the mitigation site were analyzed in order to determine which insects were present in specific areas and stages of the ecological restoration.

# 11:45 Divisional Poster Session

# MESOGRAZER CONTROL OF SEAGRASS EPIPHYTIC ALGAE UNDER AMBIENT AND ELEVATED NUTRIENT CONCENTRATIONS

Pete Weddell<sup>1\*</sup>, John Mitchell<sup>1\*</sup>, Robin McCall<sup>2</sup>, and Harriet

M. Perry<sup>2</sup>, <sup>1</sup>Mississippi Gulf Coast Community College, Jackson County Campus, Gautier, MS 39553, and <sup>2</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

Urban development along the coastal zone results in the direct or indirect input of nutrients into estuaries and coastal marine waters, with elevated nutrient concentrations contributing to eutrophication of local aquatic systems. Traditional thought held that enhanced growth by seagrass epiphytic algae, under nutrient-rich conditions, led to a decline in seagrass biomass and density due to shading by the algae. Results of more recent studies have initiated a paradigm shift, suggesting that grazing pressure can effectively counter the effects of nutrient enrichment in seagrass ecosystems. A mesocosm study was conducted to assess the effects of grazing by *Palaemonetes* sp. and a gastropod on the biomass and chlorophyll a concentration of epiphytes growing on *Ruppia maritima* under ambient and elevated nutrient levels.

# BASELINE DATA MAPS FOR THE GRAND BAY NATIONAL ESTUARINE RESEARCH RESERVE, MISSISSIPPI

Guillermo Sanchez<sup>1\*</sup>, Harriet M. Perry<sup>1</sup>, and Patricia Biesiot<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

The Grand Bay National Estuarine Research Reserve (GBNERR), part of the National Estuarine Research Reserve (NERR) System, contains approximately 27 coastal wetland habitats. The NERR system has two major national programs, (1) research and monitoring of estuarine habitats and processes and (2) education and interpretation of estuarine habitats. Several independent researchers have collected baseline georeferenced data on wetland habitat (GBNERR Environmental Impact Statement), sediment distribution (Mississippi Department of Marine Resources), and location of oyster reefs and seagrass beds (GBNERR Fellowship Program). These data have been incorporated into a single data base and maps have been created using Arcview software. State and federal agencies concerned with coastal resources and wetlands, policy makers, scientists, and the general public will be able to access this data to (1) make informed land use and management decisions, (2) gauge the effects of activities within the GBNERR, (3) support development of research needs, and (4) restore estuarine habitat. These data also provide a tool to monitor future changes in the reserve ecosystem.



PRELIMINARY INVESTIGATIONS OF THE COMPARATIVE OCCURRENCE OF SPONGE DWELLING AMPHIPODS IN *TEDANIA IGNIS* (PORIFERA, DEMOSPONGIAE, MYXILLIDAE) FROM A TURTLE GRASS BED AND A RED MANGROVE FOREST IN THE FLORIDA KEYS, USA  
John M. Foster and Brent P. Thoma\*, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

The species diversity, richness and composition of the macrofaunal amphipod communities associated with the Fire Sponge, *Tedania ignis* (Duchassaing and Michelotti, 1864), were compared from sponges collected on the roots of red mangroves (*Rhizophora mangle*) from Zane Gray Creek, Long Key, Florida to communities collected in sponges from turtle grass meadows at Anne's Beach, Lower Matecumbe Key, Florida. Initial investigations made during July of 2003 indicate that community variation is largely dependent upon the size and morphology, rather than the habitat of the sponge. Collections were made by hand in order to retain all endo- and epibiotic associates. Salinity, temperature, and depth were recorded at each site. The preliminary investigation has revealed a high diversity of amphipod species and a large population of individuals in each habitat. A more thorough study is warranted. In addition to adding clarity to the primary focus of the study, additional collections will allow examination of seasonal variation within the amphipod assemblages of each habitat, as well as examination microhabitat distribution within the host species.

#### POPULATION DISTRIBUTION OF THE BENTHIC HARPACTICOID COPEPOD *HETEROPSYLLUS NUNNI* ALONG THE MISSISSIPPI GULF COAST

Matthew Dykes\* and Judith Williams, University of Southern Mississippi Gulf Coast, Long Beach, MS 39560

The benthic harpacticoid *Heteropsyllus nunni* Coull has previously been reported only from the intertidal estuarine areas of Georgetown, SC. This copepod is unique in that during the summer months, it builds and resides within a self-made cyst, undergoing a state of dormancy (diapause). Preliminary field investigations revealed a large population of these copepods along the MS coastline. A long term field study on the population distribution of *H. nunni* was carried out along the Mississippi Gulf Coast from Biloxi, MS to Long Beach, MS. Samples were collected once a month at dead low tide approximately 6 meters out into the sandy intertidal zone. There were 8 sample sites, located 1.5 miles apart, spanning a 12 mile stretch of beach. Samples were collected using a 2.5 inch (65 mm) diameter plastic corer that was pushed down into the sand capturing the top 10 cm of sandy sediment. Three cores were taken at each site. Samples were preserved with a 10% buffered formalin solution with Rose Bengal added to dye the organisms for ease of sorting and counting. At each station, date, time, water temperature, salinity, air temperature, and specific geographical location (using handheld GIS) was

collected. The purpose of this study is to describe for the first time, the density and distribution of *H. nunni* along the MS coast.

#### IMMUNOHISTOCHEMICAL INVESTIGATION OF INSECT (ARTHROPODA; LEPIDOPTERA) NEUROPEPTIDES IN AQUATIC COPEPODS (ARTHROPODA; COPEPODA)

Scott Melton\* and Judith Williams, University of Southern Mississippi Gulf Coast, Long Beach, MS 39560

Copepods and insects are both members of the Phylum Arthropoda and are separated from one another based on morphology of mouthparts, antenna, wings and segmentation. While very different, they share striking similarities in many physiological functions and ecological adaptations. Often copepods are referred to as the "insects of the sea." Copepods and insects both are highly pigmented, use pheromones in mate-seeking behavior and many undergo programmed dormancy (diapause) during which time both arthropods will utilize lipids stored prior to dormancy. Extensive information exists on the neurophysiology of insects, but little exists on the physiology of copepods. In the silkworm *Bombyx mori*, production of Diapause Hormone (DH), Pheromone Biosynthesis Activating Neuropeptide (PBAN) and three other FXPRLamide peptides are controlled by one gene. PBAN is thought to be ubiquitous throughout the insect Orders. Data from aquatic arthropods such as shrimp, suggest PBAN may be present in them also. Dotblots performed on whole extracts of copepods reveal positive results for alpha-PMP antibody. The alpha-PMP is very similar to the PBAN, having pheromontropic activity. To test the presence of PBAN antibody in neural ganglia of copepods, the large calanoids *Aglaodiaptomus stagnalis* were embedded in wax, serially sectioned and stained to localize neural tissue. Sequential slides were then stained with the PBAN antibody using an avidin-biotinylated peroxidase kit. Copepod neural tissue showed positive reaction to the PBAN antibody.

#### DEVELOPMENTAL CHANGES IN THE SOCIAL INTERACTIONS OF A CAPTIVE-BORN ATLANTIC BOTTLENOSE DOLPHIN CALF (*TURSIOPS TRUNCATUS*)

Jennifer Davis<sup>1</sup>\*, Stan Kuczaj<sup>1</sup>, and Moby Solangi<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Institute for Marine Mammal Studies, Gulfport, MS 39502

Dolphins live in a complex social environment. Social bonds with other dolphins aid in learning, foraging, and survival. Therefore, the development of these social relationships is vital. The initial social bonds are between calves and their mothers. However, young calves begin to venture out on their own at an early age and form relationships with other dolphins, especially other dolphin calves. In this study, we examined the social interactions during the first year of life for an Atlantic bottlenose dolphin housed at MarineLife Oceanarium in Gulfport, Mississippi. Observations involved instant-

neous scan sampling over a thirty-minute time period in which samples were taken every 5 minutes. A total of ~200 hours of observations were made for the dolphin calf during its first year of life. The dolphins that were involved in each observed interaction were noted, as were the behaviors in which the animals were engaged. Although the mother was the most common partner in interactions during the early months of this calf's life, interaction with other calves increased steadily during the study period. These results support the notion that the mother-calf relationship is the primary one, and that other relationships are built upon the successful foundation provided by mother-calf interactions.

THE U.S. GULF OF MEXICO MARINE STOCK ENHANCEMENT PROGRAM: PILOT RELEASES OF HATCHERY-REARED RED SNAPPER, *LUTJANUS CAMPECHANUS*  
Angelos Apeitos<sup>1\*</sup>, David A. Ziemann<sup>2</sup>, Jeffrey M. Lotz<sup>1</sup>, Reginald B. Blaylock<sup>1</sup>, and Kenneth M. Leber<sup>3</sup>, <sup>1</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564; <sup>2</sup>Oceanic Institute, Waimanalo, HI 96795; and <sup>3</sup>Mote Marine Laboratory Sarasota, FL 34236

We are using hatchery-reared fish to investigate the feasibility of stock enhancement as a management tool for restoration of overfished species in the Gulf of Mexico, particularly the red snapper *Lutjanus campechanus*. Larvae obtained from local, wild-caught, hormonally-induced brood stock are reared at the Gulf Coast Research Laboratory in Ocean Springs, Mississippi and The Oceanic Institute in Waimanalo, Hawaii. Juveniles are tagged once they reach 90 mm total length. Various tags including dart tags, coded-wire tags (CWT), and visual implant elastomer tags (VIE) have been used. Currently CWT and VIE tags are used. In addition, approximately 5% of the snapper released in 2003 were implanted with acoustic tags. Fish are released onto artificial reefs 20–40 nautical miles offshore. Reef sites, constructed by Mississippi Gulf Fishing Banks, Inc., consist of 50-m<sup>2</sup> concrete rubble fields with 0.3–1.0 m of vertical relief in 20–30 m of water. Fish have been released using plastic bags, mesh cages, and a PVC discharge hose. Approximately 15,000 red snapper juveniles have been released during the past 3 years and tagged fish are caught in traps or observed by divers during routine assessments of both wild and released, cultured populations. Acoustic receivers close to the release sites monitor movement patterns of the acoustic-tagged snapper.

## FRIDAY MORNING

### Deer Isle

#### 9:00 HYDROLOGICAL ASSESSMENT OF MISSISSIPPI'S COASTAL WATERS—GULF OF MEXICO ESTUARINE INVENTORY AND STUDY

Christine Trigg\*, Faye Mallette, and Harriet M. Perry, University of Southern Mississippi, Gulf Coast Research Laboratory,

Ocean Springs, MS 39564

During 1968–69 a large-scale survey was undertaken to catalogue the hydrological and biological characteristics of Mississippi's estuaries [Gulf of Mexico Estuarine Inventory and Study (GMEI)]. During 2000–01, forty-two of the original GMEI stations were re-visited using protocols developed during the earlier study. This allowed for assessment of changes in the environmental health of estuarine waters at a time of increasing industrialization and population growth in south Mississippi. Sites were sampled monthly from April 2000–May 2001 in the Pascagoula, Biloxi, St. Louis Bay, and Pearl River estuaries. Temperature, salinity, and dissolved oxygen were measured in the field. Ammonia, nitrite, nitrate, orthophosphate, and total phosphate concentrations in surface and bottom waters were analyzed at the Gulf Coast Research Laboratory. High rainfall significantly lowered salinities in the 2000–01 survey. Nitrate and nitrite concentrations were higher while total phosphate and orthophosphate levels were lower in 2000–01 compared to the earlier study. Results for the 2000–01 study showed salinity, pH, and dissolved oxygen levels increasing and nitrate and nitrite levels decreasing from inshore to offshore. There was a decrease in salinity and increase in dissolved oxygen, orthophosphate, and total phosphate from east to west. Nitrate concentrations were lower in central estuarine waters than at the extremes. Temperature and pH were not significantly different among estuaries. Nitrite and ammonia concentrations were generally low throughout the study area.

#### 9:15 A RAPID ASSESSMENT OF MOBILE BAY, ALABAMA

Harriet M. Perry<sup>1\*</sup>, David Yeager<sup>2</sup>, Lee Yokel<sup>2</sup>, Kirsten Larsen<sup>1</sup>, Bradley Randall<sup>1</sup>, and Cynthia A. Moncreiff<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564, and <sup>2</sup>Mobile Bay National Estuary Program, Atlanta, GA 30303

A rapid assessment is a sampling effort of short duration in a targeted, well-defined geographic area. The approach is to collect as many different organisms as possible and return them to a laboratory for identification to the lowest taxonomic level. Rapid assessments are effective, efficient, and timely approaches to establishing baseline faunal and floral inventories and they serve as a mechanism for the identification of non-native and invasive species. Such an assessment was conducted by a multi-institutional, multi-disciplinary team of scientists from Mississippi and Alabama from September 2–6, 2003 in Mobile Bay. Over 60 participants from 15 agencies took part in the sampling effort. Although non-indigenous jellyfish (*Phyllorhiza punctata*, *Drymonema dalmatinum*), crabs (*Callinectes bocourti*, *Cardisoma guanhumi*), and molluscs (*Mytilus edulis* and *Brachidontes domingensis*) have been previously reported from the area and were listed as target species, these organisms were not encountered in the survey. Over a dozen invasive plant species were noted including

common water hyacinth (*Eichhornia crassipes*), hydrilla (*Hydrilla verticillata*), cogon grass (*Imperata cylindrica*), purple loosestrife (*Lythrum salicaria*), Eurasian water-milfoil (*Myriophyllum spicatum*), and giant salvinia (*Salvinia molesta*). In addition, a change in the distribution of some native plant species was observed. In many areas, *Spartina alterniflora* was replaced by the invasive species, *Phragmites*.

9:30 PRELIMINARY FINDINGS OF THE ABUNDANCE OF VIRUSES IN THE BAY OF ST. LOUIS, MISSISSIPPI

Raymond J. Pluhar\*, Erin A. Kirk, Megan J. Natter, Egan A. Rowe, Pradnya Sawant, Rebecca Schilling, and Donald G. Redalje, University of Southern Mississippi, Stennis Space Center, MS 39529

Variability in the spatial and temporal distribution of viruses will be examined in the Bay of St. Louis, Mississippi and related to the environmental quality of bay. SYBR Green I epifluorescent microscopy with an anti-fading solution will be used to count the number of viruses in various locations where point and non-point sources of pollution are believed to have a significant effect on environmental quality. Results obtained thus far indicate that the use of this nucleic acid stain will be an effective approach to enumerating viruses in estuarine waters. Samples will be obtained from five to ten stations, previously identified to include possible pollution sources, twice monthly during incoming and outgoing tidal regimes. Nutrients (ammonium, nitrate, nitrite, phosphate, silica), salinity, temperature, dissolved oxygen, and turbidity will also be measured at each station and compared with our estimates of viral abundance. The goal of this study is to examine the relationships between measures of environmental quality within the bay and the abundance of viruses at various stations and under a variety of environmental conditions. Initially, we could see differences in viral numbers between samples obtained from a number of stations. However, the differences could not be determined quantitatively due to sample fading problems that have since been accounted for.

9:45 FLUORESCENCE MICROSCOPY METHOD USING SYBR GREEN I FOR QUANTIFYING BACTERIOPLANKTON ABUNDANCES IN THE BAY OF ST. LOUIS, MISSISSIPPI

Egan A. Rowe\*, Pradnya Sawant, Megan J. Natter, Raymond J. Pluhar, Erin A. Kirk, and Donald G. Redalje, University of Southern Mississippi, Stennis Space Center, MS 39529

Fluorescence microscopy is the technique used most frequently to enumerate total bacteria in any aquatic environment. This study employs SYBR Green I, a nucleic acid stain, to enumerate bacterial abundances at locations in the Bay of St. Louis, Mississippi. The Mississippi Department of Environmental Quality (DEQ) and Mississippi Department of Marine Resources (DMR) periodically monitor indicator bacterial species in this system for water quality purposes. However,

these agencies rely on the multiple-tube fermentation method that provide values of indicator bacteria in most probable number (MPN) of coliform bacteria in water. This measurement, although very useful in assessing water quality, only represents a component of the total bacterioplankton population. This epifluorescence method provides a more comprehensive enumeration of the bacterial population. Previous lab experiments have shown epifluorescence microscopy experiments using SYBR Green I were considerably more effective than experiments using other standard stains. Results are incomplete; however, this methodology appears capable of effectively determining the abundance of planktonic bacteria within the Bay of St. Louis.

10:00 SPATIAL AND TEMPORAL VARIABILITY OF PHOSPHATE IN BAY OF ST. LOUIS, MISSISSIPPI

Erin A. Kirk\*, Megan J. Natter, Raymond J. Pluhar, Egan A. Rowe, Pradnya Sawant, Rebecca Schilling, and Donald G. Redalje, University of Southern Mississippi, Stennis Space Center, MS 39529

A yearlong study, started in April 2003, on environmental quality was conducted in Bay of St. Louis, Mississippi. Samples were taken bimonthly (on both incoming and outgoing tides) from 10 stations in the bay. Stations 2, 3, 6, 7, 8 create a transect line that runs from north to south down the center of the bay. Station 9 is located in the Mississippi Sound adjacent to the mouth of Bay of St. Louis. Stations 1, 4, 5, and 6a represent known nutrient sources in the bay. During the sampling period, data from stations 5 and 6a indicate that phosphate is being added to the Bay of St. Louis through human activities (e.g., sewage treatment outfalls, agriculture, runoff, and the like). However, stations 1 and 4 do not show this expected effect. Preliminary analysis has indicated that there is little difference between phosphate concentrations on incoming and outgoing tides. A seasonal pattern was also observed in the data from every station, although it is more pronounced at some stations compared to others. Low phosphate concentrations were observed during April and August; while high concentrations were found during July and October.

10:15 TEMPORAL VARIABILITY OF PHOTOSYNTHETIC ENDPRODUCT SYNTHESIS IN WEST FLORIDA *KARENIA BREVIS* BLOOMS

Megan J. Natter\*, Steven E. Lohrenz, Merritt D. Tuel, and Donald G. Redalje, University of Southern Mississippi, Stennis Space Center, MS 39529

Patterns of photosynthetic carbon endproducts of the toxic dinoflagellate *Karenia brevis* were studied throughout three yearly cruises (October 2000, October 2001, September 2002) in waters off the west coast of Florida. This study was performed under the Ecology and Oceanography of Harmful Algal blooms (ECOHAB) Florida program. The incorporation of <sup>14</sup>C was separated into photosynthetic endproducts pools (proteins, polysaccharides, and lipids) through a serial solvent

separation technique. The endproduct patterns were then used to interpret the physiological state of the population and consequently, environmental conditions/stresses in which the bloom was present. Preliminary results show an increase of protein endproducts with depth and a decrease of polysaccharide with depth. These results are due to an increase in nutrient availability and a decrease in light with depth. Further evaluation of the endproduct patterns of *K. brevis* algal blooms will clarify harmful algal bloom characteristics and give information as to why *K. brevis* blooms are persistent in Florida coast waters.

10:30 Break

#### 10:45 RESPONSE OF PHYTOPLANKTON TO NUTRIENT ENRICHMENT IN THE BAY OF ST. LOUIS, MISSISSIPPI

Pradnya Sawant\*, Egan A. Rowe, Megan J. Natter, Raymond J. Pluhar, Erin A. Kirk, and Donald G. Redalje, University of Southern Mississippi, Stennis Space Center, MS 39529

Nutrient enrichment experiments were conducted on samples from the Bay of St. Louis to study nutritional status of this ecosystem. Two representative stations were selected for the study. Station 1 represented a point source of nutrient input and Station 7, located in the middle of the bay, represented mixed water from all sources including those of the Mississippi Sound. Initial nutrient and chlorophyll concentrations varied between the two stations. Each time series experiment was conducted for a period of two weeks and included nine treatments. These treatments included one control (no nutrient additions), four treatments each with addition of nitrate, ammonium, phosphate, or silica, one treatment with all nutrients added, and three treatments with all but nitrogen, phosphate, or silica. Weekly measurements of chlorophyll a concentrations and daily in vivo fluorescence were recorded during each experiment. Preliminary results indicate that there were differences between the two stations in the way phytoplankton responded to nutrient addition treatments. For both stations, phytoplankton responses at the end of week one were different from those at the end of week two. The greatest chlorophyll yield occurred in the all nutrient addition treatments followed by the all less silica treatments indicating that diatoms responded less to nutrient additions than did other phytoplankton taxa.

#### 11:00 MACROBENTHIC PROCESS-INDICATORS OF ESTUARINE CONDITION IN THE GRAND BAY NATIONAL ESTUARINE RESEARCH RESERVE

Chet F. Rakocinski\* and Glenn A. Zapfe, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

There is a pressing need to develop broadly applicable indicators of macrobenthic processes related to ecosystem function, which potentially could be used to measure effects of

nutrient loading and other attendant anthropogenic stresses. Estimates of macrobenthic production: Biomass ratios (P:B), and parameters of linearized biomass spectra were compared among ten sites within Bayou Cumbest and Bayou Heron of the Grand Bay NERR. The former bayou system presumably receives a higher nutrient load. Transects were established within both bayous in mid-summer, 2002, proceeding seaward from the upper bayou toward adjoining bays. Both longitudinal and cross-system patterns were apparent in the macrobenthic process-indicators. Overall macrobenthic production generally increased from upestuary to downestuary; while P:B values were generally higher at upestuary sites, reflecting the general tendency for downestuary macrobenthic communities to contain larger and longer lived organisms. Moreover, macrobenthic production values were clearly higher within the Bayou Cumbest system than in the Bayou Heron system, which was congruent with the nutrient enrichment hypothesis. Macrobenthic function was characterized as a composite variable based on the three process-indicators; which in-turn was significantly related to several environmental process-variables, including concentrations of pore water ammonia and pore water total phosphorous, as well as surface chlorophyll and bottom dissolved oxygen (DO). This suggests that ecosystem function covaries coherently with macrobenthic process-indicators of estuarine condition.

#### 11:15 HABITAT FRAGMENTATION OF SEAGRASS BEDS IN BELIZE, CENTRAL AMERICA

Ryan Wally and Gary Gaston\*, University of Mississippi, University, MS 38677

We studied habitat fragmentation of seagrass beds along the Belize (Central America) barrier-reef ecosystem. The seagrass was primarily *Thalassia testudinum*, an underwater flowering plant that provides critical habitat to many marine species. We specifically wanted to address three questions: (1) Does extent of habitat fragmentation vary with latitude in Belize? (2) Is fragmentation significantly related to physical variables (proximity to channels and reefs)? (3) Is habitat fragmentation exacerbated by hurricanes? We used ERDAS and ARCVIEW software to assess habitat fragmentation, classifying seagrass first by density, then by habitat-fragment diameter. We found seagrass habitats were significantly more fragmented in central than northern Belize, seagrass fragmentation was related significantly to several physical variables, but hurricanes apparently did not result in habitat fragmentation.

11:30 Divisional Business Meeting

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## FRIDAY AFTERNOON

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### Deer Isle

#### 1:30 POTENTIAL IMPACT OF PETROLEUM RESIDUES ON THE CORAL REEFS OF BELIZE

Thomas F. Lytle\* and Julia S. Lytle, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

Twenty-nine sites from seven regions were sampled throughout coastal Belize for sediments carrying contaminants that could move from sources out of rivers across bays towards the coral reefs. These regions are, the Corozal-Chetumal industrial region, North-South Bay Transect across Chetumal Bay to the coral reefs, Sugar Cane-Refineries sites along the Rio Hondo and New River, Belize City and E-W Bay Transect, Citrus and Bananas regions, with one Inland river control. Contaminant levels of aliphatic and aromatic hydrocarbons were found throughout the Belize coastal region. Very high and troublesome levels of both types of the petroleum-type hydrocarbons were found where sugar plantations predominate and in industrial regions of Belize City and in regions dominated by banana groves. Highest contamination levels were found in the region at the mouth of the Rio Hondo River, not apparently from the sugar refinery region of Belize but from the industrial complex of Chetumal, Mexico. Evidence suggests that hydrocarbons (and trace metals) probably are as much the result of contaminant input from Mexico as from Belize into coastal waters of Belize. To prevent eventual and in some cases further damage to the coral reefs and negative effects on tourist business, it is proposed that Mexico and Belize develop a cooperative agreement to protect this very valuable international natural marine asset of the coral reef of Belize.

#### 1:45 POLYNUCLEAR AROMATIC HYDROCARBONS IN KEEGAN BAYOU, BILOXI, MS, USING COPROSTANOL TO TRACK TRANSPORT

Cheryl Jones\*, Julia S. Lytle, and Thomas F. Lytle, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

Deleterious effects to the Mississippi Gulf Coastal ecosystems are brought on by recreational, industrial and residential activities of a growing population. As a result sewage treatment plants are overloaded even before larger facilities are completed. Keegan Bayou is a small inlet in Back Bay Biloxi with little industry other than a wastewater treatment plant located at the terminus of Keegan Bayou. Polynuclear aromatic hydrocarbons (PAHs) are common components of sewage treatment wastes, originating from sources such as household hazardous waste materials, solvents, food, grease and runoff from storm drainage. The impact of the sewage treatment plant on the health of this small bayou has not been assessed. A study was designed to assess the concen-

tration and distribution of coprostanol (a fecal steroid) in sediments from the terminus of the Keegan Bayou to Back Bay Biloxi and to measure hydrocarbon concentrations at those same sites. PAH concentrations will be correlated with coprostanol as an indicator of transport from the sewage source. Hydrocarbon loads are expected to peak near the terminus with gradual decreases in concentrations toward the mouth of Keegan Bayou into Back Bay Biloxi if they are associated with sewage releases.

#### 2:00 EXPERIMENTAL EXPOSURE OF NECROTIZING HEPATOPANCREATITIS (NHP), A BACTERIAL DISEASE AFFECTING PENAEID AQUACULTURE IN THE AMERICAS, TO *LITOPENAEUS VANNAMEI* (PACIFIC WHITE SHRIMP)

Amanda G. Vincent\* and Jeffrey M. Lotz, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

Necrotizing hepatopancreatitis (NHP) affects penaeid shrimp aquaculture, causing mortalities from 20–95% resulting in devastating crop losses. Individual Kona stock *Litopenaeus vannamei* were isolated in aerated 1.5-gal Sterilite® containers and experimentally exposed to NHP via per os and injection. Twenty shrimp were injected with 0.025% w/v aqueous extract of NHP-infected tissue prepared from pooled NHP-infected hepatopancreases. Twenty shrimp were exposed per os to a quarter piece of NHP-infected hepatopancreas. Negative control shrimp, exposed to NHP-negative tissue, were included for both treatments. Shrimp were fed 5% body weight of commercial pellets per day and maintained at 30 ppt salinity/30 °C for 60 d. Day of death post-exposure was recorded and moribund shrimp were processed for NHP diagnosis. Mean survival of per os NHP-infected shrimp was 33.4 d. NHP-negative results were obtained for injection and both negative control groups. Results indicate per os is a successful method for transmitting NHP to susceptible shrimp hosts. Mean survival of *L. vannamei* infected with the viral diseases WSSV (2.9 d) and TSV (11.7 d) are much shorter than that observed for NHP. The mortality rate, the probability of death due to infection per unit time, is nearly a magnitude higher for WSSV (0.3) and TSV (0.4) compared to NHP (0.05). This research supported in part by the U.S. Department of Agriculture CSREES Grant Number 2002-38808-01381.

#### 2:15 THE CALANOID COPEPOD *ACARTIA TONSA* IS CAPABLE OF HIGH EGG PRODUCTION UNDER CROWDED CONDITIONS

Jason T. Lemus\* and Jeffrey M. Lotz, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

The calanoid copepod *Acartia tonsa* is a common cosmopolitan neritic broadcast spawner. Abundances of adult *A. tonsa* tend to be on the order of 1/L and maximum abundances may approach 30 individuals/L. However, these

reported densities may not reflect the potential production of *A. tonsa*. The effect of density on copepod production was tested by measuring the egg production of adult *A. tonsa* stocked at six densities (50/L–300/L) during two experiments. There was a significant positive linear regression between stocking density and eggs produced per 12 hours, and there was a significant negative linear regression between adult density and eggs production per adult copepod. It was estimated that a population of *A. tonsa* adults will reach peak egg production when at 475 adults/L. The effect of copepod density to limit copepod production may rarely be witnessed under natural conditions due to food limitation and predation. The potential for this high production of *A. tonsa* under high density conditions may be a reproductive strategy used in localized patches of superabundant food and few predators to compensate for future predation pressure and food shortages, and may also be a means to stockpile current food surplus with reproduction and subsequent cannibalism on the naupliar stages when the food source diminishes.

#### 2:30 THE EFFECT OF DIET ON FECUNDITY OF *ACARTIA TONSA*, A CALANOID COPEPOD

Angelos Apeitos\*, Jeffrey M. Lotz, John T. Ogle, and Jason T. Lemus, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

Red snapper, *Lutjanus campechanus*, larviculture at the Gulf Coast Research Laboratory (GCRL) uses 25 ppt artificial salt water and mixed zooplankton, primarily *Acartia tonsa*, a calanoid copepod. Presently, *A. tonsa* is produced by extensive culture of wild stocks. Estuarine water from Davis Bayou containing wild *A. tonsa* is pumped into 70-m<sup>3</sup> outdoor tanks in which copepods bloom within 24–48 hours. A controlled intensive mass culture system for copepods is under development to better support red snapper larviculture. Intensive copepod culture requires supplemental feeding, but the optimal diet is unknown. We investigated the optimal diet by evaluating the fecundity of laboratory-reared copepods fed either single or mixed species of algae. For this experiment, mated female *A. tonsa* were held singly in 10-ml containers to evaluate the effect of 3 algal diets on fecundity. Diets used were *Isochrysis galbana*, *Chaetoceros* sp. and a 1:1 mix of the two algae. Twenty five copepods were fed *I. galbana* only at a density of 150,000 cells/ml, 25 were fed *Chaetoceros* sp. only at a density of 150,000 cells/ml, and 25 were fed a mixture of both *I. galbana* and *Chaetoceros* sp. at a density of 75,000 cells/ml each and twenty five were fed no algae. Their eggs were collected and counted to estimate fecundity over a 72-hour period. The experiment was performed in duplicate. Fecundity was higher in the mixed diet treatment in both trials, and survival was higher for the same treatment after 72 hours. Fecundity was poor for both single algae diets and the poorest in the unfed treatment. Therefore, for optimum fecundity in intensive culture of *A. tonsa*, a mixed algal diet should be offered.

#### 2:45 OMEGA-3 FATS IN GULF FISHES PROVIDE IMPORTANT HEALTH BENEFITS

Julia S. Lytle\* and Thomas F. Lytle, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

Eating cold water fishes has been touted for their health benefits for years. However, not until our study of Gulf fishes was it recognized that warm water fishes also contain significant levels of omega-3 fatty acids. What is not well known is that omega-3 fats are found only in marine organisms while omega-6 fats are found in land plants and animals. Both omega-3 and omega-6 fats are important essential fatty acid families, and a balance of both families is necessary for good health. Results of clinical studies provide more and more medical reasons why an adequate balance of these fats are critical. This balance is possible only by a consumption of marine fish or fish oils. An adequate balance of these fats can provide protection against immune deficient diseases. The American diet, in general, is deficient in omega-3 fats and there needs to be concerted efforts to encourage the addition of marine seafood to the diet. Results of our study indicated that all Gulf fishes contain a relatively high ratio of omega-3 fats to their total fats, but that Gulf fishes, in general, contain a lower absolute amount of total fats than cold water fishes. Many underutilized Gulf fishes are excellent sources of omega-3 fats and could be utilized rather than discarded because they are not properly marketed. With the present health crisis, it is crucial that this information reach the public by way of school teachers, health practitioners, sports fishermen and food industries. Further, by encouraging the public to eat more Gulf seafood, we hope to aid in the trade deficit of the importation of fish into USA markets.

#### 3:00 BIOCHEMICAL ANALYSIS OF DEVELOPING EGGS OF THE AMERICAN HORSESHOE CRAB *LIMULUS POLYPHEMUS* FROM DELAWARE BAY AND THE GULF OF MEXICO

Meagan Williams<sup>1</sup>\*, Harriet M. Perry<sup>2</sup>, Kenneth J. Curry<sup>1</sup>, and Patricia Biesiot<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564

The American horseshoe crab *Limulus polyphemus* is found along the Atlantic and Gulf of Mexico coasts of North America. Although horseshoe crab eggs are an important resource for migrating shorebirds along the Delaware Bay, nothing is known about the nutritional quality of these eggs during the various developmental stages. In early summer 2003, we collected freshly fertilized horseshoe crab eggs from three locations: off the New Jersey coast in Delaware Bay and off the Mississippi and Florida coasts in the Gulf of Mexico. The eggs were reared in the laboratory and collected at various developmental stages through hatching. We found that biochemical composition of the eggs changed throughout the course of embryonic development. Information gathered from

this study provides valuable basic biological data for future protection of *Limulus polyphemus* and is valuable for ecologists in the study of horseshoe crab biology and reproduction. This study also provides useful data for investigating migratory shorebird foraging activities and could provide an essential component for shorebird management.

### 3:15 COMPARATIVE ANALYSIS OF SWIMMING BEHAVIOR BY GELATINOUS ZOOPLANKTON IN ALTERED GRAVITY: EFFECT OF CTENOPHORE APICAL COMPLEX ON ORIENTATION

Michael Dodge\*, Emilie Laiche, Michelle Melnick, Daniel Pocase, Jennifer Anderson, Brian Ortman, and Patricia Biesiot, University of Southern Mississippi, Hattiesburg, MS 39406

We studied swimming behavior of the comb jelly *Mnemiopsis mccradyi* (Phylum Ctenophora) subjected to the altered gravitational forces generated by NASA's KC-135 aircraft. In a previous study, our research group demonstrated that light appeared to provide a directional cue for this species in the absence of normal gravity. However, we could not rule out a passive response in that study. In the present study, we surgically removed the apical complex, which houses the photoreceptor and the statocyst (a balance organ), from the experimental comb jelly and compared its behavior in altered gravity to that of the control with the apical complex intact. We hypothesized that the control jelly would respond to a directed light source as before, but that the experimental jelly would remain motionless because it would be unable to sense its surroundings. We found that the control comb jelly was able to compensate for the disorienting effects of altered gravity by using its phototactic ability. However, loss of both the photoreceptor and the statocyst caused the experimental comb jelly to become extremely disoriented. Rather than remaining passive, it increased its swimming behavior dramatically but the movements were erratic and unpredictable. Our study demonstrates the critical importance of the apical complex for controlled swimming in comb jellies.

3:30 Closing Comments

### MATHEMATICS, COMPUTER SCIENCE AND STATISTICS

Chair: Ravinder Kumar, Alcorn State University  
Vice-chair: Robert S. Fritzius, Shady Tree Physics

## THURSDAY MORNING

Ship Isle

9:15 Divisional Poster Session

### THE ASSOCIATION BETWEEN BODY MASS INDEX AND MORTALITY IN HISPANICS

LaTrese Davis\*, Juan Gallegos, Beverly Gonzales, and Che Smith, Alcorn State University, Alcorn State, MS 39096; University of Houston-Downtown, TX; University of Illinois at Urbana-Champaign, IL; and Spelman College, GA

Recent research indicate that obesity is an epidemic in the United States; its prevalence continuously increases across all age groups, races, education levels, and lifestyles, causing much concern about the risks of many chronic diseases with which obesity is associated (Mokdad, 1999). It is evident that different ethnic groups have unique body compositions; thus, it is important to investigate all aspects and implications of adiposity for many ethnic groups rather than a select few. Currently, there are countless publications that have compared measures of obesity for blacks and whites, with little to no information pertaining to Hispanics. In our study, we consider data such as BMI, age, and mortality of the 51,945 Hispanic participants in the National Health Interview Survey, conducted from 1985–1994 by the National Center for Health Statistics. Along with simple data filtration and manipulation, we use logistic regression and Cox proportional hazard, which are widely used in epidemiological research. Our findings contradicted the previous findings about the American society. For non-smokers, the thinnest group had the highest mortality rates, whereas smokers had the lowest mortality rates in the obese groups. This analysis examines association between BMI and mortality, along with the combined relationship of age, smoking status, and BMI to mortality and causes of death.

### Divisional Talks

#### 9:30 LOOPING EFFECT ON KINDERGARTEN AND FIRST GRADERS

Virginia J. Moore and Sam S. Gordji\*, University of Mississippi, University, MS 38677

The purpose of this study was to examine the impact of "looping" on kindergarten and first grade students' achievement in reading. Looping is when groups of students stay with the same instructor at least two years and possibly longer. Looping is practiced in Japan and several parts of USA. In this study subjects (kindergarten students) were from New Albany, Mississippi. Subjects were tested during August when they first entered New Albany School District and in May of the following year. The subjects were administered the Marie Clay Reading Observation Survey prior to and after the study period. Both t-test and Analysis of Variance were performed on both groups individually. That is t-tests were performed only on looping group with only pre-test and post-test for one group, these analyses were performed for both groups. The pre-test and posttest for both groups (looping and non-looping) showed a significant difference. To account for this difference, the Analysis of Covariance was performed. The result indicated that at least for this group, looping did not improve students'

test score. Additionally, descriptive statistical information was obtained from the parents and students in the second year of the study when students were near the end of first grade. Results of the surveys revealed that generally all parents felt the looping process was a positive experience for their child and they believed the looping process benefited them emotionally and socially. Students also enjoyed the familiar surrounding (same teacher and classmates). This is the dissertation topic for the senior author.

#### 9:50 EVALUATING BIAS OF THE KAPLAN-MEIER ESTIMATOR FOR THE SMALL-SAMPLE CASE

Karl Calderon, Tollie Thigpen III\*, Sarah Williams, and Javier Rogo, University of Arizona, Tucson, AZ; Alcorn State University Alcorn State, MS 39096; University of Colorado, Denver, CO; and Rice University, Houston, TX

A study of the bias of the Kaplan-Meier Estimator was performed in the case of the small-sample. Research was carried out through simulation study in the interest of a controllable environment. This bias was investigated in the dependence of the censoring distribution. It is shown that the bias of the estimator remains similar as the survival and censoring distributions are derived from independent and identical distributions. It is also determined that the amount of bias does vary when stochastic order of the censoring distribution is increased and decreased. This research was done at Rice University in the summer of 2003.

#### 10:10 INFORMATION REENGINEERING FOR LIBRARY ACQUISITION: A CASE STUDY

Jessie Arnold, Bobbie Fells, Eric Speas, and Lixin Yu\*, Alcorn State University, Alcorn State, MS 39360

The university library has a bottleneck in its acquisition process checking a long list of target books against the library catalog on a one-to-one basis to avoid duplication in purchase. This is time-consuming work even though the library has been computerized for years. This project explores how to automate this process and finish the job in a minute. The project starts with examining the data flow of the acquisition process. The procedure is redesigned taking into consideration the capability of the information technology. Programs are developed to make the duplication checking a batch process. Some other features are implemented to reduce the time-consuming routine work of the staff. The experience of the project can be applied to a wide variety of applications. It demonstrates how information technology is used to improve not only the efficiency but also the effectiveness. It also shows how the information technology department can collaborate with other departments in an organization.

10:30 Break

#### 10:40 COMPUTER LAB MANAGEMENT: A COMPARATIVE STUDY OF METHODS TO KEEP LAB

#### COMPUTERS RUNNING WITH PEAK PERFORMANCE

Joseph Mwangi and Lixin Yu\*, Alcorn State University, Alcorn State, MS 39360

One of the problems with computer labs is users' changing system configuration. System files may be deleted, virus may be introduced, and application configurations may be reset. The consequence is a group of working hardware that stop serving the users, or a group of users who face a different user interface on each computer. The following maintenance methods are tested to keep the lab computers running at their peak performance: 1. Set the system profile to restrict user activities at the operating system level; 2. Use system repair software to correct problems and optimize the system; 3. Create image of the system on a CD-ROM and restore the system periodically; 4. Create image of the system, store the image on the network server, and restore the system periodically. Measurements of evaluation are set in consideration of the conflict between users' convenience of using the system and the integrity of the system, and the conflict between the ease of maintaining the system and the performance of the system. This study is not aiming at recommending the best method of keep the lab computers working. In stead, it presents a cost benefit analysis of the various ways of maintenance and helps readers to select the most suitable method for them.

#### 11:10 PERFORMANCE ANALYSIS OF LINEAR ALGEBRA AND NUMERICAL AERODYNAMIC SIMULATION BENCHMARKS ON THE MCSR BEOWULF LINUX CLUSTER

Tyler Simon\* and Tanner Pirim, University of Mississippi, University, MS 38677

The Mississippi Center for Supercomputing Research, MCSR, has recently upgraded their Beowulf research cluster. This paper intends to outline the particular method for running linear algebra and numerical aerodynamic simulation benchmarks, as well as monitor the analysis of the results. The benchmarks have been performed on a single Beowulf Linux cluster composed of 219 heterogeneous processors over 10/100 Fast and Gigabit Ethernet message passing ring networks. The results are presented in the form of millions of floating point operations per second over an interval of time and execution time for diverse configurations of computational nodes. The results achieved on the benchmarks for two network speeds have been introduced and compared. Thus, the paper addresses the importance of running such tests as a method for obtaining reliable processing capability for multi-node supercomputing applications. Thorough analysis of the benchmark results has been an exceptional guide in helping the MCSR address and reconfigure cluster bottlenecks, thereby optimizing overall system performance.



### 11:30 3-DIMENSIONAL SCENE RECONSTRUCTION AND ANIMATION USING VRML/X3D

Stephanie Myrick\* and Chad A. Steed, Naval Research Laboratory, Stennis Space Center, MS 39529

Research results are typically reported using 2-dimensional methods that include tables, figures, and charts. With the availability of 3-dimensional (3D) visualization applications, such as the Virtual Reality Modeling Language (VRML) and Extensible 3D (X3D) graphics, alternative methods of information presentation and display are becoming more common. Moreover, these 3D applications can be displayed with viewer software on conventional Internet web-browsers (e.g., Netscape and MS Explorer) with many viewers free and available for download on the Internet. These applications may be used effectively in oral presentations, and for separate viewing on the Internet. The Naval Research Laboratory (NRL) has created visualizations with VRML and X3D to expand and enhance its reporting; this paper describes applications that were developed to visualize naval amphibious assault vehicle (AAV) navigation performances during field demonstrations. Each visualization depicts a beach and ocean scenario and uses actual track data, recorded as a series of latitude and longitude points, to animate a 3D AAV model as it navigates through a planned course. The 3-D AAV model can be viewed separately to convey the physical and visual constraints of the vehicle driver and manipulated (e.g., rotated or moveable parts adjusted) and studied for familiarization purposes. This paper will address the methods used for scene reconstruction and AAV animation in these 3D visualizations.

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## THURSDAY AFTERNOON

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### Ship Isle

### 1:00 A NEW METHODOLOGY FOR CLUSTERING GENOMICS AND HEALTHCARE DATA

Haibo Wang<sup>1</sup>\*, Bahram Alidaee<sup>1</sup>, and Gary Kochenberger<sup>2</sup>,  
<sup>1</sup>University of Mississippi University, MS 38677, and <sup>2</sup>University of Colorado, Denver, CO 80237

Clustering data is intended to divide objects into groups so that objects within groups have a high degree of similarity. Without the constraints of capacities, many such clustering problems can be modeled as clique partitioning problems (CPP). The associated CCP model is solved by first re-casting it into the form of an unconstrained quadratic binary program (UQP) which is then solved by a tabu search heuristic. Many Genomics and Healthcare data are high-dimensional nominal-scaled and difficult to be clustered. We apply our model and methodology to these data and produce clustering results with high quality. We also propose two new measurement indexes to the high-dimensional nominal-scaled data in this study. This methodology can be applied to other application areas. Preliminary computational experience on the MCSR supercomputers will be presented.

### 1:20 BIT ERROR RECOVERY IN FACSIMILE TRANSMISSION

Hyunju Kim, Jackson State University, Jackson State University, Jackson, MS 39217

This research proposes bit error recovery methods for Extended 2 Dimensional MMR coded bitstream, which is used in most current facsimile machines. When an error occurs in an MMR coded bitstream, the bitstream cannot be decoded correctly after the error point so that the information after the point is lost. To prevent losing all valid information after the point, we developed a bit error recovery system that detects bit errors, determines the error region, and applies bit inversion and re-decoding to correct the errors. We also investigated the relationships between bit errors and their detection points and developed an algorithm that utilizes the error detection points to reduce computation overhead of the system. Testing results show that around 95% of bit errors are corrected with the system..

### 1:40 Divisional Business Meeting

### 2:00 MISSISSIPPI CENTER FOR SUPERCOMPUTING RESEARCH (MCSR) USER ADVISORY GROUP MEETING, POSTER SESSION, AND SPECIAL SUBSESSION ON SUPERCOMPUTING

David G. Roach, University of Mississippi, University, MS 38677

The Mississippi Center for Supercomputing Research was established in 1987 by the Mississippi Legislature and the Institutions of Higher Learning (IHL) in order to provide high performance supercomputing (HPC) support for research and instruction at all state universities. The Mississippi Supercomputer User Advisory Committee (MSUAG) was established by the IHL Research Consortium to provide user input and advice to MCSR management and technical staff on policies and procedures for the Center's operations. It includes member representatives from all IHL institutions. The Advisory Group will meet at this MAS conference. Mr. David G. Roach, Director of the MCSR, will conduct the meeting. The agenda includes an update on MCSR HPC facilities and services, introduction of new MCSR staff members, and site reports and ongoing research updates by MSUAG representatives. A poster session, showcasing research projects that utilize MCSR facilities and services, will follow the Advisory Group Meeting. A Special HPC Subsession of the Mathematics, Computer Science, and Statistics Division, sponsored by the MCSR, will also be held to serve as a forum on supercomputing in which faculty and graduate student researchers will have the opportunity to describe their research projects that involve HPC, Internet2, Grid Computing, Visualization, Network Security, Computer Systems Administration, and the use of MCSR resources. IHL faculty and graduate students, with an interest in HPC and/or MCSR facilities and services, are also invited to attend and participate.

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FRIDAY MORNING

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## Ship Isle

9:30 Workshop on Biostatistical Analysis

Organized by Elgenaid Hamadain, Co-chaired by Elgenaid Hamadain and Todd Nick

Presenters: Elgenaid Hamadain, Todd Nick, and Kanchan Manaktala

**PHYSICS AND ENGINEERING**

Chair: T.M. Parchure, US Army Engineers, WES

Vice-chair: Atef Elsherbeni, University of Mississippi

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FRIDAY MORNING

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## Caribbean

8:45 Divisional Poster Session

**A BLUEPRINT FOR DEVELOPING A LIQUID CRYSTALS RESEARCH CENTER**

Francis Tuluri, Jackson State University, Jackson, MS 39217

The present work explores the feasibility studies of developing a Liquid Crystals Research Center. Liquid Crystals is a multidisciplinary area of research and is linked to a wide range of disciplines like Condensed Matter Physics, Materials Science and Electronics Engineering. Liquid crystals exhibit interesting properties covering a wide variety of physical phenomena – elastic, dielectric, optical, phase transitional. Of several other parameters that characterize the physical phenomena of liquid crystals the important ones are elastic constants, dielectric parameters like permittivity and loss, birefringence, viscosity, density, switching times, patterns of the textures. Further, Ferroelectric Liquid Crystals have a significant role in both the fundamental and electronic display technology. Basically a Liquid Crystals Research Center can be established with three modules – Teaching, Research and Training. Each of the modules can further be expanded into several other modules depending on time and budgetary considerations. At the end, the all the sub modules can be regrouped to serve under a center. The present work also examines the role of a LQRC towards recruitment and training of students in Physics, Materials Science and Electronics Engineering.

**NUMERICAL ANALYSIS OF FORCE AND TORQUE IN MAGNETOSTATIC PROBLEMS USING MAGNETIC SCALAR POTENTIAL**

Aik Min Choong, Charles E. Smith, and Atef Z. Elsherbeni\*,

University of Mississippi, University, MS 38677

The objective of this study is to investigate the magnetic potential distribution (U), magnetic flux density (B), and magnetic field intensity (H) in a computational domain and to compute the forces and the torque between magnetic materials for a static condition, with no time varying components present. In the case of static magnetic field conditions, only the magnetic flux density needs to be considered because the equations for electric and magnetic fields are decoupled. Thus, from the well-known Maxwell's equation for B, a Laplacian equation in terms of U can be found. The Finite Difference (FD) technique will be applied to approximate U to determine the potential distribution in the computational domain. In the process of solving such type of magnetic problems, computational time is a major concern, and this investigation explores several means for reducing the time requirements. The developed code for analyzing these type problems was written in Matlab and Fortran for comparing the computational time. Matlab provides the capability for plotting simulation results, but requires large amount of time to analyze the problem. However, Fortran is able to solve the problem in a much shorter time, but it requires another plotting program to plot its results. A commercially available software, Maxwell, is also used to generate results similar to these produced by Matlab and Fortran codes. Maxwell has the capability to analyze the magnetic problem in 2D or 3D and compute the force and torque. Examples of simulation results are presented that demonstrate potential field, force, and torques distributions for several conical configurations.

**FINITE DIFFERENCE TIME DOMAIN SIMULATION OF ELASTIC WAVE PROPAGATION FOR DETECTING OBJECTS BURIED IN SOIL**

Atef Z. Elsherbeni\* and Paul L. Chin, University of Mississippi, University, MS 38677

Acoustic waves have shown, in recent years, significant success in detecting buried objects. Design of acoustic measurement devices calls for accurate numerical models to simulate acoustic wave propagation in inhomogeneous media. This paper presents a finite difference time domain (FDTD) formulation for the simulation of elastic wave propagation in poroelastic media that represents the soil and the fluid in its pore space. A first order hyperbolic leap-frog differential equation system is obtained from Biot's equations to represent the waves in the media. This system of equations is discretized on a staggered grid in time and space and is terminated by an absorbing boundary condition. This FDTD algorithm is used to study the interaction of elastic waves with mine-like objects buried in different types of soil. Numerical simulations are conducted and results are used to illustrate the advantage of using acoustic waves over electromagnetic waves in performing a more accurate detection.

## Divisional Talks

9:00 THE HIGGS BOSON AND THE ORIGIN OF MASS  
Amin Haque, Alcorn State University, Alcorn State, MS 39096

According to Higgs and other particle physicists, the fundamental constituent particles, quarks and leptons and the weak force carriers W and Z particles, acquire their masses by interacting with a force field, the Higgs field. This field permeates all space, similar in some ways to the electromagnetic field. We know from quantum theory that fields have particles associated with them, the photon being the particle for the electromagnetic field. So there must be a carrier particle associated with the Higgs field, and this is the Higgs boson. Different particles interact with the Higgs field with different strengths. Hence different particles have different mass. Some particles have no mass, because they don't interact with the Higgs field. Neutrinos barely interact with a Higgs boson, so they have a very small mass. Top quarks, which have about the mass of a gold atom, have the strongest interaction with a Higgs boson. Finding the Higgs boson is the key to whether Higgs' hypothesis for the origin of mass is indeed correct, and whether the Standard Model will survive. A small number of events have been reported that could be interpreted as resulting from Higgs bosons, but the evidence so far is not conclusive. The most probable mass for a Higgs boson is approximately 90 GeV. It is expected that the Large Hadron Collider at CERN, will be able to confirm the existence of Higgs bosons in or after 2005.

## 9:15 THE FUNDAMENTAL CONSTITUENT PARTICLES OF THE UNIVERSE AND THEIR INTERACTIONS

Amin Haque, Alcorn State University, Alcorn State, MS 39096

The building blocks of matter are the six quarks and six leptons. All matter is made from first generation particles, because the second and third generation particles are unstable and quickly decay into stable first generation particles. A proton is made of two u-quarks (charge +2/3) and one d-quark (charge -1/3), whereas a neutron is made of two d-quark and one u-quark. Physicists have found that all matter in the universe is made from quarks and electrons. Forces drive the interactions between the matter particles. Without the four fundamental forces—gravity, electromagnetic, the strong force, and the weak force—the universe could not exist. The corresponding force carrier particles are graviton (not yet discovered), photon, gluon, and W and Z. Matter particles and force carrier particles, and the last three forces are part of the Standard Model. All the particles predicted by the Standard Model have been found except the Higgs boson, the force carrier particle associated with the Higgs field, which is believed to be the mechanism by which all particles acquire their mass. In June 2003 physicists announced that they had created a new form of matter called quark-gluon plasma at Brookhaven National Laboratory's Relativistic Heavy Ion

Collider. It is expected that the Large Hadron Collider at CERN, will be able to confirm the existence of Higgs bosons. The Standard Model, however, does not currently answer certain questions, and, therefore, may be an incomplete theory.

## 9:30 SEDIMENT SUSPENSION INDUCED BY VESSEL TRAFFIC IN MISSISSIPPI RIVER

T.M. Parchure, US Army Engineer Research and Development Center, Vicksburg, MS 39180

Resuspension and deposition of fine clayey sediment has a significant impact on aquatic plants and animals. The Upper Mississippi River navigation study included estimation of environmental impact caused by an increase in navigation traffic because vessel-induced waves cause bank erosion, which in turn increases sediment in suspension. Study objectives were to estimate maximum suspension concentration caused by events of vessel passage and time for deposition of suspended sediment. Towboats and recreational crafts were the two types of vessels considered. Vessel-generated wave heights, current and suspended sediment concentration were measured in the field. Available field data were analyzed for determining statistical parameters for each wave train and generalized patterns were evolved for model runs. Particle size distribution, organic content and bulk density of surface sediment samples was determined. Laboratory tests were conducted to determine erosion rates and the critical shear strength of bed material. A numerical sediment resuspension model was developed for predicting the concentration of suspended sediment in the near-shore zone consisting of mud with significant quantities of cohesive material. Model verification was achieved through use of field and laboratory data. Conclusions: 1. Large vessels generate large drawdown, small wave heights, and high sediment concentration. 2. Small vessels such as a yacht generate small drawdown and large wave heights. 3. At high speed, small vessels also cause a substantial increase in suspended sediment concentration. The estimated suspended sediment concentrations varied from 3 mg/l to 900 mg/l depending upon the type of sediment bed, water depth, and wave conditions. The sediment will remain in suspension for duration varying from a few minutes to several hours depending upon the turbulence level.

## 9:45 SUPERSTRING THEORY AND SUPERSYMMETRY OF FUNDAMENTAL PARTICLES

Amin Haque, Alcorn State University, Alcorn State, MS 39096

According to the Standard Model, the current fundamental units of mass, quarks and leptons, that form protons and neutrons, are actually made of still more fundamental units, Strings. Superstring theory is an attempt to unify the four fundamental forces of nature. According to this theory, all the particles of the universe and all the forces of interaction are made of extremely tiny fibers or strings vibrating with different frequencies, which correspond to different energies (and mass,  $E = mc^2 = hf$ ) and force particles, charge, and spin of known

elementary particles. String theory also predicts that for every known matter particle (quarks, electron, neutrino, etc.) to have as-yet-undiscovered corresponding superforce carrier particle (photino, gluino, Wino, Zino, etc.) and every known force carrier particle (photon, gluon, W, Z, etc.) to have an as-yet-discovered corresponding supermatter particle (Squark, Selectron, Sneutrino, etc.). This concept, known as supersymmetry, helps establish a relationship between matter particles and force carrier particles. The superparticle is thought to be more massive than its corresponding particle. According to this theory, the universe is not actually made up of the four commonly experienced dimensions, but may contain 10 or even 11 spacetime dimensions. Particle physicists do not yet understand the theory well enough to make definite testable predictions. However, they think that some of its features can be supported by circumstantial evidence: extra dimensions (10 or 11), superpartner particles, fluctuations in background radiation.

10:00 Break

#### 10:15 ENVIRONMENTALLY BENIGN DESIGN AND MANUFACTURING

S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406

We are now adopting more responsible ways of designing and manufacturing products for the global market. Economists are at last accepting the twin facts of finite resources and limited sinks. ISO 14000 is helping to change our thinking on business as usual. Companies have begun to feel proud of going green. When it comes to greenness, European Union is flexing its muscles to drag the United States. Innovations in science and technology are accelerating the transformation toward environmentally benign design and manufacture. The website <http://www.wtec.org/loyola/ebm/> describes the types of efforts essential for such a transformation. A recent (2001) study has gathered "information on research and development around the world aimed at developing alternative methods for materials processing with the purpose of minimizing toxic material generation and optimizing products and byproducts for sustainability and reuse characteristics." From environmentally benign manufacturing (EBM) technologies viewpoint: "Europe leads in most governmental activities, Japan in industrial activities, and the results for research and development are mixed. The United States leads in financial and legal liability concerns, water conservation, decreased industrial releases to air and water, and research in polymers and long term electronics, but follows in all other areas. In the area of university educational activities, and both industry and government sponsorship of these, it is clear that Europe leads, followed by the United States and then Japan. Overall, therefore, the United States ranks third behind Europe and Japan.

10:30 ANALYSIS AND DESIGN OF A NOVEL COPLA-

#### NAR WAVEGUIDE FED SLOT ANTENNA FOR ULTRA WIDEBAND APPLICATIONS

Abdelnasser A. Eldek, Atef Z. Elsherbeni\*, and Charles E. Smith, University of Mississippi, University, MS 38677

In applications where loss, dispersion, size, weight, cost, performance, ease of installation, and aerodynamic profile are constraints, printed slot antennas are required. Moreover, in some applications like wireless and radar communications systems wide bandwidth and high gain are of the main design objectives. In this research, a novel printed slot antenna design fed by a coplanar waveguide is introduced and denoted as lotus antenna. The antenna is a modified version of the conventional slot dipole and bow-tie slot antennas that is recently designed by the authors for X-band operation. The lotus antenna is evolved from the smooth transition from the coplanar waveguide to the slot in a lotus shape. The bandwidth of the lotus antenna extends from 8 to more than 30 GHz. The antenna is fabricated and the return loss measurements agreed very well with the simulation results. Linear arrays of 8 and 16-element of this antenna are analyzed for gain enhancement. The main advantages of these arrays are the ultra wide bandwidth and low cross polarizations (less than 20 dB). The radiation pattern, return loss, coupling, directivity and gain of these arrays are computed and will be presented.

#### 10:45 SIMPLIFIED FEEDING STRUCTURE FOR A MODIFIED PRINTED YAGI ANTENNA

Guiping Zheng\*, Ahmed A. Kishk, Allen W. Glisson, and Alexander B. Yakovlev, University of Mississippi, University, MS 38677

A modified printed Yagi antenna with a simplified feeding mechanism is presented in this work. In this new design, a transmission line formed by two parallel strips printed on the opposite sides of the dielectric substrate is used to feed the printed Yagi antenna. The parallel strips are connected to a microstrip line with a truncated ground plane, which acts as a reflector in the printed Yagi antenna. Both the microstrip line and parallel strips are carefully designed with the characteristic impedance of 50 ohms. This feeding network is naturally operating in the odd mode starting from the feeding point for all frequencies. The driver length is chosen to be approximately a half of the wavelength at the central frequency used in the design and the length of parallel strips is chosen to be about a quarter of the wavelength. This simplified feeding structure results in the reduction of the transmission line length, and, consequently, the radiation losses. The analysis of the modified Yagi antenna is performed numerically using commercial FEM and FD-TD softwares.

#### 11:00 SIMULATION OF ELECTROMAGNETIC SCATTERING FROM TWO DIMENSIONAL CHIRAL OBJECTS USING AN ITERATIVE PROCEDURE

Mohamed H. Al Sharkawy and Atef Z. Elsherbeni\*, University of Mississippi, University, MS 38677

An Iterative scattering procedure is developed to solve the problem of scattering from a two dimensional chiral objects simulated by circular cylinders, illuminated by either a TE<sub>z</sub> or a TM<sub>z</sub> plane wave. The developed formulation and the implemented code simulate different types of cylinders, where the cylinders can be made of either lossy or lossless anisotropic chiral material with uniform or non-uniform chiral admittance distribution, homogeneous isotropic dielectric material, perfectly conducting material or a combination of all of them. The technique applies the boundary conditions on the surface of each cylinder in an iterative procedure. After adequate number of interactions (theoretically infinite), the total scattered field is obtained based on summation from all interactions. Numerical verifications are presented to prove the validity of the formulation before presenting the scattering from an array of chiral cylinders showing significant RCS reduction in forward or backward directions based on the selection of the chirality parameter.

11:15 Break

#### 11:30 BAYESIAN INFERENCE TECHNIQUES FOR THE DESIGN OF ANTENNA ARRAYS

John. M. Earwood, Matthew J. Inman, Atef Z. Elsherbeni\*, and Charles E. Smith, University of Mississippi, University, MS 38677

The design of antenna arrays is often challenging in that there are a large number of parameters that must be taken into account. Typically, the design of an antenna array is simplified by holding certain sets of parameters constant, such as the element spacing, so that other parameters, such as the element phasing and amplitudes, may be determined independently. Many analytic approaches, such as Fourier or Woodward-Lawson synthesis, have been used in the past to assist in the design of arrays. These methods, however, can be lacking in the flexibility that is often required in many cases. Conversely, trying to fully explore an array with many parameters becomes difficult due to computational limitations once the number of parameters becomes large. This paper deals with techniques employed to accurately sample from the parameter space to find the best set of parameters for a specified radiation pattern. Steps used to utilize these inference techniques using modern programming languages will be discussed. This will show how a program can employ the Bayesian techniques in an efficient manner. Results will show good match with the specified radiation patterns in many cases.

#### 11:45 MODIFIED PERFECTLY MATCHED LAYERS METHOD FOR PERIODIC STRUCTURES

Guiping Zheng\*, Ahmed A. Kishk, Allen W. Glisson, and Alexander B. Yakovlev, University of Mississippi, University, MS 38677

In this work, a modified Perfectly Matched Layer (PML) method for periodic structures is presented. In many

applications, the structures have a periodicity in one or two dimensions, such as a frequency selective surface (FSS), a photonic bandgap (PBG) structure, or an infinite antenna array. The finite-difference time-domain (FDTD) technique has been successfully used to analyze the characteristics of these kinds of structures by applying the proper periodic boundary conditions (PBC). Because the periodicity is in one or two dimensions, the other sides of the structure in the FDTD analysis are required to be truncated by PML, which has been proven to be very effective for this purpose. Due to the difficulties that involve the time delay and time advance across the grid when modeling these periodic structures in direct way, field transformations are introduced to remove the time gradient across the grid. Therefore, PML procedure used to truncate the FDTD computational domain must also be applied to these field transformations so that they can absorb the outgoing waves properly. In this work, the transformed PML has successfully modeled a 2D PBG structure with different incident angles. This method did not require the integral form in the transmitted fields and is more efficient than the Uniaxial PML (UPML). The transformed PML in the 3D case will also be investigated in our future work.

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### FRIDAY AFTERNOON

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#### Caribbean

#### 1:30 E-WASTE A UNIVERSAL PROBLEM

Pao-Chiang Yuan, Jackson State University, Jackson, MS 39217

E-Waste is the fastest growing solid waste problem in the country and in this century. E may stand for electricity or electronic. This research mainly focuses on Electronic Waste, with emphasis on computers and cellular telephones. Everyday we develop new technologies, but we also generate a lot of other materials we do not expect. Are we responsible for them? Yes. What happens to these materials after their end-of-useful life? Well, for most of us, we place them in the trash. Most people's attitude is to not care because it is not their problem. This, "not in my mind" and "not in my backyard" syndrome should be changed. We have to remember that none of these materials used on computers or cellular phones is biodegradable. If you bury them, they may be in the landfill forever, and if you burn them, they may generate dioxin and toxic products. Today, most homes have one or more computers and cellular phones. One computer is being used and another may be stored in the attic, garage, and basement or is for just decoration. This research presents the problem caused by computers and cellular phones. We will also investigate adverse health effects and the experiences we encounter in our recycling program at Jackson State University. Additionally, we will use Toxic Characteristic and Leaching Procedure (TCLP) test to examine the major parts of the computers and cellular phones to show their hazardous properties, all of them exceeds the EPA (Environmental

Protection Agency) regulatory levels.

#### 1:45 YOU WANT AN EXPLOSION? I GOT YOUR EXPLOSION RIGHT HERE!

John Patrick Lestrade, Mississippi State University, MS 39762

From their discovery in the mid 60s until the launch of a dedicated orbiting observation platform in 1991, gamma-ray bursts (GRB) were studied by only a handful of scientists. During that time, GRB were believed to be rather benign events related to neutron stars in our galaxy. However, observations over the past decade have shown that these bursts of gamma rays originate, not in nearby space, but in very distant galaxies. The knowledge of their immense distances, coupled with the observations of high gamma-ray fluxes, have brought the realization that these are the largest explosions in our universe since the Big Bang. The continuing mystery of what could cause such violent bursts has attracted increasing numbers of GRB enthusiasts, astronomers from each of the domains of the electromagnetic spectrum, mathematicians, science fiction writers, and even trekkies (Graf, L. 2000 in *Star Trek: New Earth*.) In this presentation I will summarize the currently-accepted burster models and describe the ramifications if one were to explode in our part of the Milky Way.

#### 2:00 AN AUTOREGRESSIVE MODEL OF GAMMA-RAY BURST TIME PROFILES

Daniel Logue<sup>1\*</sup>, John Patrick Lestrade<sup>1</sup>, Jane Harvill<sup>1</sup>, Jean-Luc Atteia<sup>2</sup>, and Roggie Boone<sup>3</sup>, <sup>1</sup>Mississippi State University, MS 39762; <sup>2</sup>Observatoire Midi-Pyrénées, Toulouse, France; and <sup>3</sup>Valdosta State University, GA 31698

Gamma-ray bursts (GRB) are highly energetic explosions of unknown cosmic origin with extremely complicated time profiles. The asymmetric features and stochastic jumps in these profiles clearly call for a nonlinear statistical analysis of the data. Of the infinitely large class of nonlinear models, we have chosen the univariate functional coefficient autoregressive (FCAR) models. Our general equation for a GRB time series is  $C(t) = F(Y(t-d)) * C(t-1) + e(t)$  where  $C(t)$  is the burst count rate at time  $t$ ,  $Y$  is an independent exogenous variable,  $F(Y)$  is the general functional coefficient,  $d$  is the time lag (usually zero), and  $e$  is random noise with finite variance. Examples of possible exogenous variables are: (1) count rate at an earlier time in the burst itself, in which case  $d \geq 1$ , (2) time, or (3) the relative average energy (hardness) of the photons in a time interval. Initial analyses of the pre-burst background, using the count rate at lag 1 as the exogenous variable, have resulted in the expected linear coefficients. Any departure from linearity is indicative of a departure from randomness. We find hints of specific non-linear trends in the burst portion of the data. However, because of the low signal-to-noise ratio of most bursts, we may need to invoke smoothing methods that would more clearly yield the intrinsic burst characteristics.

#### 2:15 MAPPING ANOMALIES IN THE EARTH'S MAG-

#### NETIC FIELD WITH THE GAMMA-RAY BURST DETECTOR, FREGATE

Brad Newton Barlow<sup>1\*</sup>, John Patrick Lestrade<sup>1</sup>, and Jean-Luc Atteia<sup>2</sup>, <sup>1</sup>Mississippi State University, Mississippi State, MS 39762, and <sup>2</sup>Observatoire Midi-Pyrénées, Toulouse, France

To a first approximation, the Earth's magnetic field is a slightly-tilted dipole offset from the center of our planet. A peculiar feature of this field is the South Atlantic Anomaly (SAA), a weak spot off the east coast of Argentina/Brazil where radiation-belt particles are able to penetrate to low altitudes. The SAA is problematic for many orbiting x-ray and gamma-ray detectors because the high fluxes of charged particles can result in false triggers and sometimes cause damage to spacecraft circuitry. To further complicate the picture, Tamagawa et al. (2003) present evidence of a second, transient, SAA-like magnetic field weakness that is near Ecuador. We use the orbital data of FREGATE, a set of gamma-ray burst detectors that are flying on the HETE-2 satellite, to search for recurring features caused by these and other possible field weaknesses. One goal is to corroborate the presence of the Equador Anomaly and help define its temporal behavior.

#### 2:30 Divisional Business Meeting

#### PSYCHOLOGY AND SOCIAL SCIENCE

Chair: Ann Marie Kinnell, University of Southern Mississippi

Vice-chair: Pamela Banks, Jackson State University

#### FRIDAY MORNING

Petit Bois

#### 8:45 Divisional Poster Session

#### THE SEEKING OF NOETIC GOALS TEST: A PSYCHOMETRIC REVIEW AND DIRECTIONS FOR FUTURE RESEARCH

Joseph L. Benedict\*, Walter S. Benjamin\*, Natalie L. Cathcart\*, John T. Herzog\*, Jason R. Payne\*, Elizabeth D. Kolivas, and Stefan E. Schulenberg, University of Mississippi, University, MS 38677

The Seeking of Noetic Goals test (SONG) was originally developed by Dr. James C. Crumbaugh in the 1970s. The SONG is a 20-item attitude measure with a multiple response format developed to assess a person's motivation to find life purpose. Higher scores are interpreted to mean that the person has more motivation to discover life purpose. Although higher scores on the SONG have been associated with negative

psychological states such as anxiety and depression, Hutzell (1987) cautioned that the SONG's primary use should be for research purposes, primarily due to concerns about the SONG's validity in clinical populations. Hutzell observed that the SONG may be useful in empirical studies of the association between motivation to find life purpose and other variables. These studies have not been systematically conducted. The emphasis of this psychometric investigation is that additional research as to the SONG's reliability and validity needs to be conducted with increasingly diverse populations before the measure's true utility is realized. References: Hutzell, R. R. (1987). Seeking of Noetic Goals test. In D.J. Keyser and R.C. Sweetland (Eds.), *Test critiques: Volume VI* (pp. 486-490). Kansas City, MO: Test Corporation of America.

#### TEMPORAL LIMITS IN ASYNCHRONY PERCEPTION

Angelique Horace<sup>1</sup>\*, Brianna Conrey<sup>2</sup>, and David Pisoni<sup>2</sup>,  
<sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>Indiana University, Bloomington, IN 47405

One way to study how our senses normally combine information from the auditory and visual senses is to explore the limits of how separate auditory and visual sources of information are combined in perception. Measuring participants' performance in discriminating between whether an audio-visual stimulus is synchronous or not is one way to assess these limits. The aim of this study was to determine whether the duration of the non-speech stimulus has an effect on whether it is perceived asynchronous or synchronous. Earlier research on asynchrony detection using an asynchrony detection task identified a window of time when asynchronous information was deemed synchronous (Conrey and Pisoni, 2003). For the present study a similar asynchrony detection task was employed. The task consisted of 25 levels of asynchrony on four different conditions. The four conditions in this study were a full-face visual stimulus and three non-speech conditions: 33 ms in length, 100 ms in length, and 500 ms in length. Behavioral data was obtained on the level of asynchrony the participants judged to be synchronous. The present study yielded a similar window of time of synchrony detection on asynchronous stimulus to the Conrey-Pisoni study. Analysis of this window included using repeated measures ANOVA and paired t-test to examine the Mean Point of Synchrony, High Threshold of the Curve, and Low Threshold of the Curve. Results of this study indicated that there was no significant difference in the ability to detect asynchrony due to the length of the non-speech stimulus.

#### ROLE (BENEFIT) OF SPOUSAL INVOLVEMENT IN RECRUITMENT FOR CLINICAL TRIALS

Bern'Nadette Knight\* and Gail D. Hughes, University of Mississippi Medical Center, Jackson, MS 39216

Cancer is one of the leading health problems facing men today, especially African-American males. Decreased participation in cancer screenings, clinical trials, and prospec-

tive cohort studies by African-American males is of great concern. Little is known in the literature of the role/benefit spousal involvement has on recruitment and retention in clinical trials. Focus groups were used to elucidate barriers to participation and retention among African-American males in clinical trials. Six focus groups were conducted among African-American males diagnosed with prostate cancer and four among their spouses/partners between ages 50-78. Female spouses/partners' opinions were sought to explore their impact on decision making processes of men to seek screening, medical attention, and participation in clinical trials. Spouses/partners can serve as advocates for male recruitment into clinical trials and should be involved throughout the entire medical process—screening, treatment, and clinical trial. Involving spouses/partners initially in the medical process encourages successful recruitment of males into clinical trials. Findings suggest that female spouses/partners can effectively be used as advocates to increase participation of males. Resource materials explaining the purpose and significance of clinical trials must be presented to both male and female partners in a culturally appropriate manner. Researchers and health-care professionals must acknowledge and incorporate female spouses/partners as a crucial component of the recruitment and retention process in clinical trials. This will increase patient education, information dissemination, and participation/retention of African-American males in clinical trials.

#### PERCEPTIONS OF A DESIRABLE BODY FRAME: ANALYSIS USING SILHOUETTE DRAWINGS

Ayanna Shivers\*, Mindy Ma, and Pamela Banks, Jackson State University, Jackson, MS 39217

The objective of this study is to explore the perceptions that African American women have about their body frame. Literature suggests that there are discrepancies of body frame among Caucasians. A Body Image Questionnaire was given to African American students at a Historically Black University in the southern part of the United States. This questionnaire included nine silhouette drawings (Forbes, Adm-Curtis, Rade, and Jaberg, 2001) of female figures ranging from 1 (thinnest frame) to 9 (largest frame). The participants were given the option to respond to any question with a rating between two figures (i.e., 5 ½). Results indicated that women displayed high satisfaction with their own bodies by comparing their own reported silhouette to the silhouette they most would like to have (.693,  $p > 0.01$ ) and the type that most women would like to have (.490,  $p > 0.01$ ). The type that they believed most men would like was very accurate compared to the type men rated as most attractive (1.00,  $p > 0.01$ ). Findings of this study further suggest that more studies on body image be conducted using minority populations.

# ASPARTAME INCREASES FOOD INTAKE AND WEIGHT GAIN IN RATS

A. Kurt Thaw\*, Valerie Lauro\*, and Holly McNeal, Millsaps College, Jackson, MS 39210

Aspartame discussions have been common in the scientific and lay literature for over a decade. Opponents suggest various maladies caused by Aspartame, while supporters tout its useful applications. A significant point of contention concerns whether Aspartame is effective as a diet aid. The assumption that Aspartame leads to fewer calories consumed per day may be intuitive, but perhaps premature. The established physiological effect known as Early Cephalic Reflexes is a response to sensory stimuli that prepares the body for incoming nutrients. Insulin release is the primary effect. Aspartame consumption leads to Early Cephalic Reflexes without the delivery of sugars which may increase hunger. To test the hypothesis that Aspartame consumption leads to excess food intake 32 rats were divided into two groups of 16. Each group had *ad libitum* access to food from 1400 h to 0900 h each day. From 0900 to 1400 all food was removed and 50 ml of either sucrose (group 1) or aspartame (group 2) was made available. After 2 consecutive weeks the sweet solutions were reversed for the groups. Each rats' feeding behavior and bodyweight were recorded daily. Results indicate an increase in total calories, weight gain, and rate of food intake for the Aspartame group. When the groups were switched this trend switched as well. With this procedure significant increases in calories and weight gain occur with Aspartame consumption compared to sucrose intake.

# FACTORS THAT INFLUENCE VOLUNTARY REGURGITATION IN CAPTIVE BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*)

Deirdre Yeater<sup>1</sup>\*, Jennifer Davis<sup>1</sup>, Peter Sugarman<sup>1</sup>, Stan Kuczaj<sup>1</sup>, and Moby Solangi<sup>2</sup>, <sup>1</sup>University of Southern Mississippi Hattiesburg, MS 39406, and <sup>2</sup>Institute for Marine Mammal Studies, Gulfport, MS 39502

Voluntary regurgitation is common among captive cetaceans, and is a potential health hazard for animals that participate in this activity. Regurgitation instances and the circumstances surrounding such instances were studied by observing two adult and two juvenile Atlantic bottlenose dolphins. These dolphins were housed in a pool at Marine Life Oceanarium in Gulfport, Mississippi. The dolphins' behaviors were observed in thirty minute blocks using an instantaneous scan sampling method in which the behavior of each dolphin was noted every two minutes. There were approximately eighteen hours of observations each week for 12 weeks. Regurgitations were categorized in terms of what was regurgitated, such as a whole fish, a partial fish, or a cloud of small particles and liquid. For each regurgitation event, it was also determined which dolphin regurgitated, whether another dolphin observed the regurgitation, the context in which the regurgitation occurred, and the outcome. The outcome con-

cerned what happened to the regurgitated fish, which often included playing with the fish and re-eating it. Behaviors preceding and following regurgitation events were also examined to determine factors that influence voluntary regurgitation. The results suggest that dolphins practice voluntary regurgitation until they are able to produce a fish or piece of fish with minimal effort. The dolphins in this study appeared to regurgitate fish in order to play with the fish, and so voluntary regurgitation may be an example of dolphins enriching their own lives as best they can.

Special Session: Life during the 1700s on the Mississippi Gulf Coast—The Moran Studio (22HR511) Burials

# 9:00 NATIVE AMERICAN LIFE ON THE NORTH-CENTRAL GULF COAST DURING THE PROTO-HISTORIC PERIOD: AD 1550–1700

Jason A. Gardner, University of Southern Mississippi, Hattiesburg, MS 39406

The protohistoric period in the Southeast, which began with the first European contact with Native Americans, was in many areas a time of substantial change for the aboriginal populations. The prehistoric period immediately preceding had witnessed the florescence of chiefdom-level societies in this area, but there was no evidence of this political complexity noted by the French upon their arrival to the Mississippi coast in 1699. Instead, they found small, dispersed tribal groups including the Biloxi, Pascagoula, and Capinans. Prior to this contact, very little written evidence exists, so the archaeological record provides our only view of this dynamic period. The bioarchaeological evidence in many places, especially coastal areas such as the Mississippi coast, suggests that most people were relatively disease-free and had a healthy, balanced diet. Many of the ceramic motifs of this period are more abstract and highly stylized than previous periods. Also, there was a political breakdown of chiefdom-level societies into smaller, tribal groups. Reasons for the increased material abstraction and political turmoil remain unclear, though missionization efforts by the Spanish and internal political dynamics may have provided an impetus. What is more certain is that not all aboriginal populations succumbed to the diseases and trauma introduced by the Spanish in the sixteenth century. More significantly, many coastal groups were maintaining the successful subsistence and economic practices of their prehistoric ancestors, despite the chaos of European colonization. If these are indeed French colonists under Moran's Art Studio, then they not only would have encountered, but also interacted with the local Indian populations on a daily basis.

# 9:15 LIFE DURING THE 1700s ON THE MISSISSIPPI GULF COAST

Edmond Boudreaux, University of Southern Mississippi, Hattiesburg, MS 39406

The first European contact on the Mississippi Gulf



Coast took place in 1697. That year, Pierre Le Boyne, Sieur d'Iberville, had orders to locate the mouth of the Mississippi River, build a post, and block other nations from claiming the Mississippi. In 1698, Iberville's expedition left La Rochelle, France and arrived at Ship Island on February 10, 1699. By 1719, concessions lined the shores of Biloxi. They cleared land, planted crops, built cabins, warehouses, and boats to transport them to land grants in the interior. The capital was transferred to Biloxi in 1720 and remained there until 1723 when it was moved to New Orleans. The period from 1720 to 1723 was extremely hard on the colonists. In 1721, 2500 people were listed at New Biloxi. This large number, plus the lack of knowledge of soil conditions, climate and constant shortage of provisions, created many hardships. These included plagues and virtual famine that forced many to eat plants and herbs which often caused death instead of bringing nourishment. Records indicate that many got sick and died after eating oysters they harvested by wading in the Mississippi Sound (hypothermia). The priests could not keep up with death records. In 1914 and 1969, human bones were discovered on property located east of Porter Avenue on the Beach. Twelve skeletons were ultimately found during archaeological excavation, and they appear most likely to belong to the French colonists who occupied the site in the early 1700s.

#### 9:30 COLONIAL FRENCH MORTUARY PRACTICES ON THE NORTH GULF COAST

Donald Craig, University of Southern Mississippi, Hattiesburg, MS 39406

On October 22–24, 2003, eight 18th-century French burials were excavated beneath the Moran Art Studio in Biloxi, Mississippi. The burials were discovered during clean-up activities in the aftermath of Hurricane Camille in 1969, and have been on display through an access panel in the floor since that time. The burials included six European males and two European females. The burials were laid out in a row from east to west. While typical European burials were laid out in rows, they were usually all in the same direction and facing east. Six of the skeletons had their heads to the south, and two of the skeletons had their heads to the north. All the burials were supine with their hands crossed over their pelvis. It has been reported that during earlier excavations of the burials in the 1980s that some of the bones had been removed and then reburied. The two skeletons with their heads to the north appeared to be disturbed, but the other six skeletons appeared to be undisturbed. These burials are compared with ethnographic descriptions of French Colonial burials, adding to the understanding of mortuary and religious practices of Europeans in the protohistoric Southeast.

#### 9:45 A STUDY OF THE ANCESTRAL AFFINITY OF INDIVIDUALS FROM MORAN ART STUDIO IN BILOXI, MISSISSIPPI

Krista Burleigh, University of Southern Mississippi, Hatties-

burg, MS 39406

During the clean up of Hurricane Camille, 12 burials were discovered in Biloxi, MS, under what is today Moran Art Studio. These burials were thought to represent both Native American and French individuals that died during a famine in the early 1720s. It was difficult to draw reliable interpretations because no artifacts were found with the burials; therefore, a study was undertaken to determine the racial affinity of the individuals. A set of craniometric measurements, including skull width, nasal breadth, and facial breadth, along with dental traits were observed and measured. Using a series of discriminate functions based on measurements from individuals of known ancestry, the measurements from the Biloxi burials were analyzed using the Giles and Elliot (1962) formulae. Various morphological features associated with race were also observed. All measurements were run through Fordisc 2.0, a forensic database developed by the University of Tennessee in 1994. The final analysis showed that the group was predominately European with two possible Native Americans present. These findings are discussed in light of the local history of the time.

#### 10:00 ANCESTRY, ROBUSTICITY, AND STATURE: IDENTIFICATION THROUGH LONG BONE MEASUREMENTS AT THE MORAN BURIALS, BILOXI, MISSISSIPPI

Cindy Carter, University of Southern Mississippi, Hattiesburg, MS 39406

In October of 2003, the University of Southern Mississippi Department of Anthropology investigated a group of burials located under the Moran Art Studio (22HR511) in Biloxi, Mississippi. The burials were located after Hurricane Camille caused structural damage in the late 1960s and appear to belong to French colonists. This project analyzed the length and robusticity of the individuals. The long bones, most frequently the femur and humerus, were measured in situ using both an osteometer and sliding calipers. The data collected was subsequently calculated using FORDISC™ to identify the race and sex of the remains. At least two females were represented among the skeletons. Average height was 5'6" for males and 5'2" for females. Robusticity measurements indicate that the subjects were in relatively good health at time of death. Comparisons with similar remains of Native Americans of the late prehistoric period show them to be very similar. Preliminary indications through relative dating suggest that the remains were those of French colonists linked to the original Biloxi settlement. All results are discussed in light of findings from other European populations of the same era.

#### 10:15 Break

# 10:30 AN ANALYSIS OF TOOTHWEAR PATTERNS AND CARIES PRESENT ON TEETH OF BURIALS RECOVERED FROM MORAN ART STUDIO AND THE INDICATIONS OF DIET OF EARLY EUROPEAN COLONISTS

Stacey Young, University of Southern Mississippi, Hattiesburg, MS 39406

In October students from the University of Southern Mississippi excavated a group of burials located beneath the floor of the Moran Art Studio in Biloxi. The burials were exposed after Hurricane Camille passed through the area in 1969. Preliminary investigations revealed approximately twelve burials were present. At this time, eight have been uncovered. Six skulls were brought back to the University of Southern Mississippi lab for further investigation. On site identification revealed that the remains likely belonged to Europeans, and from what is known about the history of the area it is likely they were those of French colonists. An analysis of the teeth of six skulls was conducted. The scoring methods of Scott (1974) and Smith (1976) were used to record toothwear patterns and caries. These are two indicators of health which can be used to determine quality of diet. When teeth are used for purposes besides chewing, or to grind gritty foods, heavy wear patterns are present. This pattern was common among populations consuming bony fish and shell. In Native American populations, teeth are often reduced to rims of enamel. In this sample, tooth wear looks to be generally light, which is consistent with the more processed diet of Europeans when compared to Native Americans. Caries are produced by the breakdown of tooth enamel by acids. Acidic foods were more commonly associated with agricultural diets and those of starchy foods. Caries and tooth loss was quite high, indicating a greater dependency on agricultural foods. The results were compared to other European and Native American populations and discussed in terms of diet.

# 10:45 AN EXAMINATION OF DIET AMONG THE COLONIAL FRENCH IN BILOXI USING ISOTOPE ANALYSIS

Ashley Siedell, University of Southern Mississippi, Hattiesburg, MS 39406

In October 2003, Anthropology students from the University of Southern Mississippi excavated eight human burials under Moran's Art Studio in Biloxi, Mississippi. Although some are covered with shellac, most of the burials are in fair condition. Data collected on site and analyzed using FORDISC™ determined the remains to be Caucasian. The remains are most likely French colonials from the 1700s. In order to examine the diet of the subjects, two samples of cortical bone were taken from the femora of an adult male and an adult female. The samples were then sent to the Beta Analytic, Inc. in Florida for isotope analysis. Carbon-13 measures the amount of C3 and C4 plants in the diet. C3 plants include most grasses such as wheat. C4 plants include tropical

flora such as maize. Thus, we can discriminate between consumption of Old and New World foods in the diet. Nitrogen-15 is important in measuring sources of protein in the diet, especially according to placement in the trophic chain. Nitrogen-15 can also be used to discriminate between terrestrial and marine sources of protein. The results confirmed expectations that the population consumed many local foodstuffs, although maize consumption was less than that observed in Native Americans. A heavy dependence on marine resources was also determined. No differences in diet were found between the sexes. These findings will be compared with discussions of diet in the historical record.

## Regular Session

# 11:00 DECOMPOSITION PATTERNS IN SOUTH MISSISSIPPI DURING SUMMER

Dale Norton, University of Southern Mississippi, Hattiesburg, MS 39406

Processes regarding human decomposition are often indistinct and can lead to confusion concerning circumstances of death. This is especially true of fetal and infant remains since relatively little research has been done with individuals from this age group. In an effort to overcome this, an exploratory study was conducted using bush babies, a small African prosimian, as a model to identify critical aspects regarding decomposition during summer in the southeast U.S. Two bushbabies corpses, which died of natural causes were frozen and then thawed, removed of hair, and placed in wood frames covered with wire mesh. One box was covered with ¼ inch wire mesh and the other with ½ inch wire mesh. The boxes were placed on the ground in a rural, wooded setting. A third bushbaby was placed about one foot underground within a wood-frame box with ¼ inch wire mesh on the bottom. The corpses were observed for a series of variables, including insect activity, skin sloughing, and body temperature. Environmental conditions, such as ambient temperature and ground temperature, were recorded. Generally, the progression of decomposition followed that seen in human adults, although the insect activity was less intense. It was also found that the exposed corpses decomposed in about four weeks. These findings will be discussed in light of the local conditions, and implications for other environmental settings will be offered. The possible differences between the decomposition of bushbaby and human infant tissues will also be addressed.

# 11:15 COMPARISONS OF SCAVENGERS OF SOUTHERN MISSISSIPPI IN A TAPHONOMIC SETTING

Patricia Miller, University of Southern Mississippi, Hattiesburg, MS 39406

A forensic case recovered in the state of Mississippi exhibited extensive damage to the remains. The areas of the body missing included the arms below the elbow and the legs below the mid-thigh. Based on the extensive gnawing marks,

it was determined that most of the damage to the remains was done postmortem by scavengers. Subsequently, the present study was then undertaken to determine what type of scavenger was responsible. Molds were made of tooth mark impressions left on the long bones. These were then compared with those of potential local scavengers, including rodents. An analysis using scanning electron microscopy suggests that dogs were the most likely perpetrators. Further work was undertaken, taking molds from bones gnawed by dogs of various sizes. Comparisons were made, and it was determined that the dog was large in size.

11:30 CAUSES AND IMPLICATIONS OF SHELL-SHOCK IN RALPH ELLISON'S INVISIBLE MAN  
Derrick Spires, Tougaloo College, Tougaloo, MS 39174

Through *Invisible Man*, Ralph Ellison attempts to deconstruct common stereotypes concerning African American one-dimensionality, docility, and blindness through his narrator's developmental strivings. A key node in his struggle is his time spent in the Golden Day (GD), a brothel, gaming house, and weekly recreational retreat for a group of World War veterans housed in an asylum near his school. The GD is much more than a physical entity; it acts as an ideological location where power and social paradigms become upended and reconfigured. As a result of the GD phenomena he is able to eventually take up the vets' striving to break free of white American reality by transcending these binary oppositions underground. The question, however, remains—what causes the veterans to go insane? Was it shell shock from World War One, and if so, where did it come from and how was it diagnosed? Does their insanity stem from returning home to a racist society in which the honors and respect they earned in Europe becomes void? Or are these veterans not clinically sane, but socially insane, because they chose to pursue professions were supposedly off-limits for African Americans? As mental illness becomes more prevalent in the African American community it is important that we make the conceptual distinction between clinical insanity and socially projected insanity. Using the veterans in *Invisible Man* I intend to explore the differences between the two and test my findings on contemporary issues such as post-traumatic stress stemming from police brutality and racial profiling.

11:45 GENDER AND ONLINE GAMES  
Ashley Craig, University of Southern Mississippi, Hattiesburg, MS 39406

Online games are growing and competitive new market of entertainment media that presents an interesting sociological dynamic in gender differences among players. The methods employed in this study included extensive online research on the topic of online games, and subject matter drawn from the researcher's own experience. The research indicates a significant gender gap in the reasons for playing online games, with female players preferring the cooperative commu-

nicative aspects of the game and male players preferring the competitive aspects of the game. There is also a large gender imbalance in the players, male players significantly outnumbering female players. The study explores some of the reasons why these differences might exist, and possible solutions in creating a more gender neutral virtual playing field. This paper contributes to the literature on gender by exploring the social conditions and behaviors of men and women in virtual spaces.

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## FRIDAY AFTERNOON

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### Petit Bois

1:30 Divisional Business Meeting

### Session A

1:45 AN EVALUATION OF THE AMERICAN COMMUNITY SURVEY: PRELIMINARY RESULTS FROM A COUNTY LEVEL ANALYSIS OF THE OREGON TEST SITE

George Hough and David Swanson\*, Portland State University, Portland, OR, and University of Mississippi, University, MS 38677

The American Community Survey (ACS) is a Census Bureau product designed to provide accurate and timely demographic and economic indicators on an annual basis for both large and small geographic areas with the United States. Operational plans for Census 2010 call for ACS to replace the decennial census long-form (Census LF), pending the results of evaluation studies. This plan represents a major change in that variables that traditionally have been collected on a "snapshot" basis once every ten years would be collected on a "rolling" annual basis. Using a Loss function Analysis and other tools, this paper reports preliminary findings from a comparison of ACS and Census LF in Multnomah County, Oregon, one of five national "local expert" test sites set up to compare ACS data collected at the time of Census 2000. The preliminary findings suggest that there are notable differences between some of the corresponding variables found in the ACS and Census LF that require more detailed examination. The Loss function Analysis reveals notable differences for race and disability variables. In other comparisons of corresponding variables between ACS and Census LF, differences are found within each of the four major areas of interest ((1) demographic characteristics; (2) social characteristics; (3) economic characteristics; and (4) housing characteristics), with housing characteristics showing the least similarity overall. These results also suggest that more detailed examinations are needed to understand differences between corresponding variables collected by ACS and the Census Long Form.

## 2:00 MEANING-BASED PSYCHOLOGICAL TREATMENT OF FAMILIES WITH CHILD CANCER PATIENTS

Hillary R. Hunt\* and Stefan E. Schulenberg, University of Mississippi, University, MS 38677

Families with child cancer patients experience a variety of psychological sequelae such as finding meaning, given the child's medical condition. Although medical interventions are undertaken, frequently the psychological needs of the child and his or her family are neglected. A systematic review of the empirical and descriptive literature suggests that a major area to address is helping the family retain a sense of purpose in light of what is perceived as a negative prognosis. Psychological treatments focusing on spiritual growth, transcendence, and finding meaning in suffering are increasingly being used. One example is Viktor Frankl's logotherapy. Logotherapy is a form of psychotherapy geared toward helping people establish and/or maintain a sense of life purpose even under intense and unavoidable suffering. Logotherapy appears to be a unique method of helping children and families cope with the diagnosis and course of cancer. A significant amount of research has been conducted using quality of life instruments with both patients and families. Systematic comparisons of these instruments with measures of meaning is an important direction for psychometric research. Such research will aid in better understanding the reliability and validity of these measures, as well as in quantifying benefits of psychological treatment.

## 2:15 LOGOTHERAPY AND BOWEN FAMILY SYSTEMS THEORY

Elizabeth M. Malone\* and Stefan E. Schulenberg, University of Mississippi, University, MS 38677

Both Frankl's logotherapy and Bowen's Family Systems Theory (FST) have been shown to relate to peoples' physical and psychological well-being. Historically, logotherapy emphasizes the individual, while FST emphasizes the family as an emotional unit. The following paper outlines logotherapy and FST, summarizing the major constructs of each theory and comparing and contrasting the theories, applications, and research. Beginning with Murray Bowen, we outline the history of his training and his eight interlocking concepts, such as differentiation of self. The concept of nuclear family emotional process is presented, while outlining ideas of emotional distance, marital conflict, and sickness. The other concepts of triangles, family projection process, emotional cutoff, sibling position, and emotional process in society are also outlined. Frankl's logotherapy is summarized beginning with his history of training and the significance of his time spent in Nazi concentration camps. The dimensions of the human include the physical, psychological and emotional dimensions. The noetic dimension is discussed as well as the will to meaning, tragic triad, tragic optimism, and existential vacuum. Frankl's approach to therapy, and applications of

logotherapy to a family situation are explored, including the goals, as well as direct and indirect approaches. The engagement and commitment to the therapeutic relationship is highlighted. Finally, the two theories are compared and contrasted along the dimensions of history, fundamental concepts, and the approaches to therapy.

## 2:30 REACTIVE ATTACHMENT DISORDER CHILD ASSESSMENT TO PROTOCOL DEVELOPMENT

Chalonda Handy<sup>1\*</sup>, Mark Kilgus<sup>2</sup>, Michelle Moser<sup>2</sup>, and Shaila Khan<sup>1</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>East Tennessee State University

The purpose of this study was to research and develop an assessment battery for evaluating Reactive Attachment Disorder. Reactive Attachment Disorder (RAD) is a disturbed condition that is brought on by gross care and inappropriate conditions that the child has undergone previously in life. RAD is a severe psychological disturbance that can occur in children during the first few years of life. RAD can present itself in children by age five. There are two forms of RAD: disinherited and inhibited. Little research has been conducted on RAD. There are few assessment measures that are designed specifically to diagnose RAD. As a result, treatment centers for RAD employ a combination of assessment measures designed to recognize other mental health problems such as Bipolar Disorder, Post Traumatic Stress Disorder, and other co-morbid disorders that affect young children. Existing protocols including assessment instruments and structured clinical interviews for identifying children with Reactive Attachment Disorder and other co-morbid conditions were located. Objective assessment instruments to be used in the proposed battery were reviewed and critiqued. These objective instruments included behavioral checklists, clinically structured interviews, and assessment measures commonly used to diagnose other psychological disturbances found in children. Present information on the validity and reliability for each measure was reviewed. A proposed assessment battery was identified. The proposed battery is a multi-method, multi-informant, assent instrument that can be used to identify RAD and other co-morbid diseases found in children.

## 2:45 Break

## 3:00 THE STROOP EFFECT WITH INTERVENTION ON AUDITORY STIMULI

Angela Scott<sup>1\*</sup>, Shaila Khan<sup>1</sup>, and William Heindel<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>Brown University, Providence, RI 02912

The stroop effect has been proven many times, and it is known as an attention procedure in which automatic process takes place. The comparison suggest an interfering effect of color stimuli upon reading names of colors, with the interfering effect of word stimuli upon naming the colors (Stoop, 1935). The hypothesis states that (1) if two things are automatically

processed when the stimuli is given simultaneously then one will override the other, (2) it is also hypothesized that the parallel theory of automatic processing is correct. There is a total of 30 students volunteering for extra credit in a general psychology course at Brown University. 15 of the students will be given the task of carrying out a reaction time test on a programmed computer testing the original stroop effect paradigm. Fifteen students will be given the stroop effect with the intervention an auditory stimuli. The visual stimuli consisted of the words green, blue, and late written in the color blue or green. The auditory stimuli consisted of hearing the words green, blue, and late through headphones. The words all were modified to have a 20 millisecond (ms) fade in and fade out, and they lasted for duration of 400 (ms). The design of the experiment is a 3 X 3 repeated measures design. Normal distribution analysis will be done across groups in order to compare before the stimuli and after the stimuli. In order to distinguish the variables, incongruent and congruent, across the design an analysis a variables will also be done.

### 3:15 EARLY MOTHER-INFANT INTERACTIONS AMONG GARNETT'S BUSHBABIES (*OTOLEMUR GARNETTII*)

Sarah Wilhelms<sup>1</sup>, Sheree Watson<sup>1\*</sup>, Angela McGuire<sup>1</sup>, and Michelle Becker<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>University of Memphis, Memphis, TN

In non-human primate species, mother-infant interactions during the first days of life may provide important foundations for the subsequent development of the infant. However, for many species, including Garnett's bushbaby, early behavioral interactions between mother and infant have not been well characterized. In addition, because bushbabies usually have only one offspring per parturition, little is known about the effect of twinning on activity budgets and rearing behaviors. Seven female bushbabies and their 12 offspring (2 singletons, 5 sets of twins) were video-taped for 30 min/day during the first 30 days postpartum. T-tests revealed that mothers groomed their infants more often than they groomed themselves ( $t(6) = 5.05$ ,  $p = 0.002$ ). Conversely, infants groomed themselves more often than they groomed their mothers ( $t(11) = 12.69$ ,  $p < 0.001$ ). Mothers of singletons performed significantly more bouts of autogrooming than mothers of twins ( $t(5) = 4.8$ ,  $p = 0.005$ ). Infants averaged 3.6 bouts of exploratory behavior per hour, but most of these were observed during the second half of the 30 day observation period. Although there was considerable variability among infants in propensity to explore their environment, twin siblings tended to be consistent with each other. These results provide insights regarding early rearing practices of bushbabies and early behaviors of bushbaby infants. This study provides a basis for further investigation of the influence of the mother-infant relationships on developmental patterns of the infant.

### 3:30 USE OF ANESTHESIA DOES NOT INCREASE

### ACCURACY OF ANTHROPOMETRICS IN GARNETT'S BUSHBABIES (*OTOLEMUR GARNETTII*)

Stacey Curry\*, Sheree Watson, and Marie Danforth, University of Southern Mississippi, Hattiesburg, MS 39406

Scientists who use animal models in research are mandated by the Animal Welfare Act to employ the "Three Rs" in research methodology: Reduction, Replacement, and Refinement. Refinement involves eliminating or modifying invasive procedures to reduce the distress experienced by the animal. For example, it has been suggested that anesthesia should be used judiciously and only when necessary. However, modification of anesthesia protocols is feasible only if accuracy of data is not compromised by the modification. Anesthesia is routinely used during collection of anthropomorphic data (i.e., anatomical measurements) to ensure accuracy. In the present experiment, we examined the effect of eliminating anesthesia on accuracy of anthropometrics in Garnett's bushbaby, a prosimian primate. We obtained two sets each of 10 measurements, including body, snout, arm, leg, and tail length, ear and eye spacing, maximum cranial length, maximum cranial breadth, and bizygomatic breadth. One set of measurements was obtained while the animals were awake and manually restrained whereas the other set was obtained while the animals were anesthetized with Ketamine HCl. Paired t-tests were used to compare the results of the two sets of measurements. There were no significant differences on any of the measurements. Thus, use of anesthesia did not increase accuracy of the anthropometrics. These results indicate that anthropometric data can be accurately collected from prosimian primates without use of anesthesia.

### 3:45 CORTISOL RESPONSE TO RELOCATION STRESS IN GARNETT'S BUSHBABY (*OTOLEMUR GARNETTII*)

Sheree Watson<sup>1\*</sup>, Ronda Stavisky<sup>2</sup>, Tammy Greer<sup>1</sup>, John McCoy<sup>1</sup>, David Hanbury<sup>1</sup>, and Sarah Gamon<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>University of Texas, Austin, TX

Relocation of research animals, either within a facility or from one facility to another, is assumed to be stressful. Development of appropriate research methodologies may be facilitated by understanding the extent and duration of the physiological response to relocation stress and whether the stress is buffered by environmental or social factors, like the presence of a cagemate. To characterize the response to relocation stress in Garnett's bushbaby, we assessed cortisol levels in 10 female and 6 male bushbabies during relocation to a different facility. Six of the animals were pair-housed at the time of the move and were moved with their cagemate. Fecal cortisol was assessed at three timepoints: (1) Baseline — one day prior to moving; (2) Relocation — the day the animals were relocated; and (3) Post-relocation — seven days after the relocation. Repeated measures Analysis of Variance revealed differences in cortisol values with post hoc tests indicating an

increase in cortisol at the Relocation timepoint compared to Baseline and Post-relocation ( $F(2,28) = 4.73, p = 0.047$ ). Baseline and Post-relocation cortisol levels did not differ. There were no differences in cortisol levels as a function of having a cagemate during the relocation. These results indicate that although relocation resulted in a significant cortisol increase, levels returned to baseline within seven days after the stressor. Moreover, the effects of the stressor were not diminished by the presence of a cagemate.

## FRIDAY AFTERNOON

Chandeleur

Session B

### 1:45 ARE FRIENDS MORE SIMILAR THAN NON-FRIENDS

Minervia E. Scott\*, Susaye Ratigan, and Elizabeth Lemerise, Jackson State University, Jackson, MS 39217; Hiram College, Hiram, OH 44234; and Western Kentucky University, Bowling Green, KY 42101

The purpose of this study was to find out whether children who are friends are more similar than randomly paired children matched for age and gender. This study used archival data from 5 elementary schools in a small southeastern city. The sample consisted of 1,437 first to fourth grade children attending ungraded primary classes in combinations of 2 grades: 1–2, 2–3, and 3–4. Reciprocated “like best” nominations defined a friendship. Two kinds of friendships were identified in these ungraded classrooms: (a) friendships between children who were from the same grade level; and (b) friendships between children who were in adjacent grade levels. To address the question of whether friends are more similar than non-friends, teacher ratings of problem behaviors and social competencies, peer assessments of liking and social behaviors, and children’s social information processing were examined in friend and non-friend pairs. The results indicated that friend pairs who were from the same grade level were significantly more similar than random pairs of same grade children. However, friend pairs who were from adjacent grade levels had far fewer statistically significant areas of similarity. The findings were congruent with the “birds of a feather hypothesis” and support the idea that same-age friends are similar to one another.

### 2:00 EVALUATION OF THE HEALTH BEHAVIORS OF AFRICAN-AMERICAN COLLEGE STUDENTS

Wesley Prater\* and Safiya Omari, Jackson State University, Jackson, MS 39217

Research indicated that the health behaviors of college students play an important role in the psychological health of students. These health concerns among American college students share a common factor — African-Americans are at a

higher risk. In this study, African-American college students at a Historically Black College/University (HBCU) and their health risk behaviors were examined. Our goal was to determine whether their mental health and their attitudes towards health play a role in these risk behaviors. We examined the prevalence of tobacco use, their sexual behavior, their weight, exercise habits, mental health, and their education on health. 113 African-American undergraduate students participated in this study. The students were administered a Health Association’s National College Health Assessment. Our results indicated that the average student was not in good health, overweight, sexually active, and used alcohol. However, depression was not a significant problem for the students. Stress and relationship problems most affected student’s academic performance. It can be concluded that students need to receive more information from their university about pregnancy prevention, physical activity and fitness, and alcohol/drug use. The school should enforce rules dealing with marijuana and alcohol use.

### 2:15 DOES SUICIDE HISTORY OR PLAN INFLUENCE COMMITMENT DECISIONS

Kendria Funches\* and Lillian M. Range, University of Southern Mississippi, Hattiesburg, MS 39406

Researchers have not determined which factors increase the likelihood of involuntarily hospitalizing a suicidal family member. Therefore, the purpose of this study was to examine the likelihood of one’s civil commitment of a family member who has a history of suicide and/or a specific plan to commit suicide. A total of 97 African American and Caucasian American undergraduate college students were randomly assigned to read one of four vignettes that described a younger sibling as depressed, hopeless, and thinking of suicide. Participants completed the Suicide Ideation Scale about their own suicidal thoughts and rated how likely they would be to ignore the thoughts, to tell the sibling that suicide is not a good thought, to refer the sibling to therapy, and to commit the sibling to a mental hospital. In most responses, history and plan made no difference. Regardless of whether the sibling had a history or plan, students were unlikely to ignore, likely to tell the sibling that suicide is not a good idea, and likely to refer to therapy. In terms of committing, however, plan made a difference: when the sibling had a plan, participants were slightly likely to commit and moderately sure that they would take this action. In contrast, when a sibling had no plan, participants were neutral to commit and slightly sure that they would take this action. Like therapists in other research present untrained college students recognized the imminent risk of a suicide plan.

### 2:30 DEVELOPMENT OF AN UNDERGRADUATE STRESSOR SCALE

Shelle Rogers, Jennifer Holcomb, and Reid Jones\*, Delta State University, Cleveland, MS 38733

The initial conception for the Undergraduate Stressor Scale was patterned after the Holmes Rahe Social Readjustment Rating Scale. Common stressors for the undergraduate were identified and items developed for an existing undergraduate stressor scale were added. The resulting 50 item scale required respondents to provide intensity ratings from 1 (not distressing) to 4 (very much distressing). The preliminary instrument was administered to 153 undergraduate volunteers along with five published scales rating emotional and personality constructs. Internal consistency for the scale was high (Chronbach's  $\alpha = .92$ ). Further, each of the five other survey instruments provided significant ( $p < .05$ ) evidence for construct validity of the stressor scale. Item analysis suggested that a potent form of stressor was related to being overwhelmed by assignments and tests coming at the same time.

2:45 Break

### 3:00 STRESSORS AND LOCUS OF CONTROL IN THE UNDERGRADUATE

Ashley Mahalite, Jennifer Barnett, and Reid Jones\*, Delta State University, Cleveland, MS 38733

A survey of 50 common stressors was completed by 69 undergraduates. Subjects also provided background demographics and completed Leary's Internal Control Index (ICI). One group completed the stressor survey before the ICI and the other group completed the ICI followed by the stressor survey. Students with higher ICI scores reported significantly ( $p < .05$ ) fewer and less intense stressors. Those students completing the ICI first reported significantly ( $p < .01$ ) more intense stressors. Several possible explanations for this last effect were considered.

### 3:15 EMOTIONAL STATES OF UNDERGRADUATES AS AFFECTED BY STRESSORS AND PERSONALITY TRAITS

Natayla Jennings, Sallie Simmons, and Reid Jones\*, Delta State University, Cleveland, MS 38733

Eighty-five undergraduates at a public, regional university received class credit for participating in research relating current emotions and recent stressors to longer term personality traits. The two sub-scales of Spielberger's State-Trait Anxiety Scale and his State-Trait Anger Scale were all significantly ( $p < .05$ ) associated with a survey of 50 stressors commonly occurring during the undergraduate years. Regression analysis was used to determine the relative contribution of traits (anxiety and anger) and current stressors as predictors of current emotional states (anxiety and anger). Multiple  $R$ 's were substantial ( $R = .7128$  for anxiety and  $R = .4787$  for anger), both significant beyond the  $p < .01$  level. In the resulting regression model, long term traits were significantly associated with current states, while the stressor ratings were not.

### 3:30 THE USE OF A MODIFIED BLOOM'S TAXONOMY IN DESIGNING COURSE OBJECTIVES AND ASSESSMENTS

Darlene Crone-Todd\* and Jenetta Waddell, Delta State University, Cleveland, MS 38733

The development of critical, or higher-order, thinking skills is considered to be a hallmark of higher education, and required for many programs. Despite this emphasis on higher order thinking, there has been little development of reliable and valid instruments for designing course objectives and assessing student work. Recent advances in this area by researchers at the University of Manitoba (Canada), using undergraduate psychology courses, include a further modification of Bloom's Taxonomy of Educational Objectives (Bloom, 1956). This modification involves developing tighter operational definitions for Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation levels of thinking. Previous research demonstrated that the first four levels are reliable and valid measures of the constructs. The present paper will address extending the use of the modified taxonomy to the Synthesis and Evaluation levels of the taxonomy, and to other disciplines at Delta State University. Reliability measures will be presented, along with current and future directions in the research.

#### SCIENCE EDUCATION

Chair: Aimée T. Lee, University of Southern Mississippi

Vice-chair: Sheila Brown, J.L. Scott Marine Education Center

## THURSDAY MORNING

Pacific

### 9:30 TEACHING ABOUT AQUATIC NUISANCE SPECIES

Austin Taylor\* and Kay Baggett, Mississippi Gulf Coast Community College, Jackson County Campus, University of Southern Mississippi, J.L. Scott Marine Educational Center and Aquarium, Biloxi, MS 39530, and National Aeronautics and Space Administration

The purpose of this project was to educate fourth through sixth grade students about invasive species. The project involved researching local invasive species, creating a short PowerPoint presentation of these species, and developing age-appropriate educational activities to reinforce the presented information. The project was presented to students in several classrooms for the targeted grades and evaluated by their teachers for perceived value using a Likert-scale evaluation. To measure the content effectiveness of the presentation, pre- and posttests were administered, analyzed, and interpreted.

9:45 A NEW INTERACTIVE DISPLAY AT THE SCOTT AQUARIUM: INCORPORATING AGE-APPROPRIATE, INTERDISCIPLINARY ACTIVITIES ABOUT THE OCEAN ECOSYSTEMS AND ADAPTATIONS OF MARINE ORGANISMS

Mollie K. Giles\* and Becky Espey, Mississippi Gulf Coast Community College, Jackson County Campus, University of Southern Mississippi, J.L. Scott Marine Education Center and Aquarium, Biloxi, MS 39530, and National Aeronautics and Space Administration

The primary objective of this project has been to create an interactive educational display representing various aspects of the ocean ecosystem and adaptations of marine creatures. Children may choose to participate in a variety of age-appropriate, interdisciplinary activities. The project consisted of building a children's interactive exhibit in the Scott Aquarium. The exhibit consisted of backboards upon which various descriptive paragraphs and interactive activities were displayed for the children's use. These activities include worksheets, puzzles, books, games, and "hands-on" examples of sea creatures. The project included choosing subject matter, researching information on the chosen subjects, reviewing interactive educational materials, and constructing the actual exhibit. This project was based upon the Scott Aquarium exhibits located in "Imagination Stations" used in the Biloxi Public School System.

10:00 THE USE OF PHYSICAL WATERSHED MODELS FOR GRADES 6 THROUGH 12 SCIENCE STUDENTS IN MISSISSIPPI

R. Gonzalez<sup>1</sup>\*, W.L. Kingery<sup>2</sup>, and D.H. Huddleston<sup>2</sup>, <sup>1</sup>West Lowndes Middle School, Columbus, MS 39701, and <sup>2</sup>Mississippi State University, Mississippi State, MS 39762

This paper will discuss several hands-on experiments used to teach grades 6 through 12 science students about watershed hydrology using a physical model constructed using relatively inexpensive materials. Plexiglass boxes were built to accommodate soil materials that enable simulation of three dimensional river systems. The model let students visualize a range of river processes. They were given the opportunity to interact with the model and investigate river dynamics, sediment transport, erosion, and erosion control. An evaluation was made of students' use of critical thinking and scientific problem solving in designing and performing scientific research and experimentation. The pedagogical implications of these experiments with kinesthetic and visual learners were evaluated. These activities allow teachers and students to focus on various learning styles in science. Further, state requirements in physical, chemical and biological sciences, as well as environmental issues and processes, can also be addressed. The models permit students to summarize the interrelationships among resources and human activities in their local environment.

10:15 THE EFFECT OF A CONTROLLED BURN BASED ON CHEMICAL ANALYSES AT A FORT BAYOU SITE

Matt Reudelhuber\* and George Ramseur, Mississippi Gulf Coast Community College, Jackson County Campus, National Aeronautics and Space Administration, and The Nature Conservancy, Ocean Springs, MS 39564

The local branch of The Nature Conservancy, based in Ocean Springs, owns plots of land which it is attempting to maintain or return to a "natural" state. The Old Fort Bayou Mitigation site is an example of this type effort. To date, the focus of the restoration attempts has been in the form of controlled burns. Historically, fire has served as a natural stressor necessary to expose the seed bank and limit overgrowth. The purpose of this project has been to determine whether or not the burns have been changing the composition of the soil. Results of this effort will indicate if the soil is returning to the state necessary to support the rare species which are known to flourish in pine savannas. This study involved selecting a control and burn area from three sites for the chemical determination of soil composition.

10:30 Break

10:45 TEACHING KINDERGARTNERS ABOUT THE LIVES, DEVELOPMENT, AND EXTINCTION OF DINOSAURS

Amanda Weaver\*, Teresa Callahan, and Patricia Hodges, Mississippi Gulf Coast Community College, Jackson County Campus; National Aeronautics and Space Administration; and Magnolia Park Elementary School, Ocean Springs, MS 39564

The purpose of this project was to teach kindergarten students the importance of history on dinosaurs. The students learned about the time of period in which the dinosaurs lived, the process of dinosaur extinction, and how the dinosaurs played an important part in the development of today's world. The project also included hands on activities in which the children made paper mache dinosaur eggs, became a type of dinosaur for a day, and an activity that taught them the same water supply that the dinosaurs used is still used today. This project helped the students understand the historical significance of dinosaurs.

11:00 CREATING A KIDS' PAGE FOR THE J.L. SCOTT MARINE EDUCATION CENTER AND AQUARIUM

Brandi Hamilton\* and Chris Snyder, Mississippi Gulf Coast Community College, Jackson County Campus, University of Southern Mississippi, J.L. Scott Marine Education Center and Aquarium, Biloxi, MS 39530, and National Aeronautics and Space Administration

This project was designed to provide children visiting the MEC&A web site with information and activities concerning local marine animals and habitats. This web page is a



component of the Center's main web site and has different, age-appropriate activities in which kids can participate. This web page includes an activity and game page, an information page on fish, and a page listing activities and/or programs that the Center offers for kids. The activities will provide information to visitors in an entertaining and interesting way. This web page will be linked to the home page of the MEC&A web site.

#### 11:15 CONCEPTUAL AND ATTITUDE CHANGE OF COMMUNITY COLLEGE STUDENTS THROUGH THE READING-WRITING-SCIENCE LEARNING CONNECTION

Aleta Sullivan, Pearl River Community College, Poplarville, MS

This qualitative research investigates the influences of reading popular science magazines and writing personal essays and their influence in facilitating learning in science. Another purpose of this study is to investigate the effect of constructivist teaching practices and cooperative learning to attain conceptual change among community college students in a Human Anatomy and Physiology course. The affective dimension of learning anatomy and physiology through reading and writing was studied by examining students' attitudes and personal beliefs expressed in their essays. This research combined several methods to engage the learner: reading an article of the learner's choice from the "Vital Signs" series of Discover Magazine, writing an essay on the article read, collaborative group discussions, and critique of the essay. The students wrote essays using guiding questions provided by the researcher. The essays were shared during the collaboration and critique sessions when students were in base groups. Reading and writing facilitates adult learners' conceptual change in a human anatomy and physiology course through the linking of concepts to previous life experiences, whether personal or previously studied materials. The positive effects of the cooperative learning on minds-on construction of knowledge on adult learners' attitudes toward reading and writing about human anatomy and physiology were expressed during the focus group interviews. The choice of reading materials, working with peers, and freedom to express personal beliefs regarding the medically related articles positively influence the adult learners' interest in continued reading and learning in human anatomy and physiology.

#### 11:30 PERFORMANCE IN COMMUNITY COLLEGE MICROBIOLOGY CLASSES IMPROVED THROUGH USE OF ACTIVE LEARNING STRATEGIES

Mary Lux, University of Southern Mississippi, Hattiesburg, MS 39406

Active learning has been a time-honored tradition in microbiology laboratory courses. Emphasis on active learning in the lecture component of the course is equally important. Over the course of two summers, students enrolled in Microbi-

ology at the Forrest County Allied Health Campus of Pearl River Community College participated in a study to determine the effectiveness of active learning in the classroom setting. The study involved three sections of the course. Each section met once a week for a five hour block of time through the 10 week summer semester. One section was the control section and participated in limited active learning activities during lecture. The other sections were the test sections. Lecture time was allotted for active learning strategies such as creating illustrations, completing tables, working with small groups, and answering questions posed in the Socratic tradition. The same amount of material and the identical tests were used for all classes. Pretest were taken on the first day of each section, and the identical 10 questions were incorporated into a 100 item final exam. The results of the study yielded the following average scores for pretest and post test, respectively: control, 12 and 47, test sections (averages), 14 and 68. The higher scores on the post test and final for the test groups suggest that the active learning activities increased student learning.

#### 11:45 Divisional Business Meeting

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### THURSDAY AFTERNOON

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#### Pacific

#### 1:00 TEACHING EDUCATORS ADVANCE MATH AND SCIENCE (TEAMS): IMPROVING TEACHER QUALITY AND PROFESSIONAL DEVELOPMENT PROGRAM

Babu P. Patlolla\*, Noland J. Boyd, Theophilus Danzy, Jr., and Josephine M. Posey, Alcorn State University, Alcorn State, MS 39096

Alcorn State University conducted a four-week summer workshop for local middle school and high school teachers. Eighteen teachers were selected from Natchez/Adams, Claiborne, Hazlehurst, Jefferson, Vicksburg, Warren Central and Wilkerson Schools. Primary goals of this workshop were: to strengthen the teachers' content knowledge and teaching skills in math and science, to make them aware of technology and new class room techniques and to introduce ways to help students to close the gap between society's science illiteracy and apply science facts and ideas to daily life. The core of the summer activities included class room/laboratory hands-on activities, computer application projects, visit by professional scientists and field trips to Medical Center, Waterways Experiment Station and USDA laboratory. Two follow-up sessions are planned for the 2003-2004 academic year to discuss how the participants are incorporating their new knowledge in their class. Participants enjoyed the workshop and are eager to share their experiences with their colleagues. (This program was funded by Mississippi Institutions of Higher Learning through No Child Left Behind: Improving Teacher Quality Grant Professional Development Program # 2003-53E)

# 1:15 A POST-BACCALAUREATE PROFESSIONAL PORTAL TRACK TO MEDICAL AND DENTAL STUDY AT THE UNIVERSITY OF MISSISSIPPI MEDICAL CENTER

Rob Rockhold, University of Mississippi Medical Center, Jackson, MS 39216

The School of Graduate Studies in the Health Sciences at UMC announces the initiation of the Professional Portal Track (PPT), a two-year, Master of Biomedical Science degree-accurring postbaccalaureate training program for educationally- and economically-underserved students who are interested in entering degree programs in Medicine or Dentistry on the UMC campus. An applicant to the PPT must first make application to the school of ultimate interest (Medicine or Dentistry) through regular admission procedures for that school. The appropriate Admission Committee will recommend a student for entry into the PPT, based on a student's background, on evidence that a student demonstrates behavioral characteristics desired in a contemporary physician or dentist, and on evidence of a student's interest in treating Mississippi citizens currently underserved by health care. An applicant must register for/have taken the Graduate Record Examination. The academic emphasis of the program will be (1) enhancement of relevant academic skills, (2) acquisition of a body of basic biomedical knowledge, and (3) analysis of health care delivery to the underserved within the State of Mississippi. A student who completes the seven quarter academic program in good standing and fulfills specific individual criteria specified during the admission process will be afforded admission in to the school of their interest. An inaugural class of up to 15 students will be admitted in the Summer of 2003.

# 1:30 BASE PAIR AND THE COMMUNITY SCIENCE FORUM (CSF): USING THE POWER OF THE CHILD TO EDUCATE THE VILLAGE

Rob Rockhold<sup>1\*</sup>, Susan Bender<sup>2</sup>, Jordan Butler<sup>3</sup>, Cindy Cook<sup>3</sup>, Susan Neral<sup>1</sup>, and Donna Sullivan<sup>1</sup>, <sup>1</sup>University of Mississippi Medical Center, Jackson, MS 39216; <sup>2</sup>Jim Hill High School; and <sup>3</sup>Murrah High School, Jackson, MS 39216

The CSF is a community outreach activity for Base Pair and UMC. Its purpose is to use high school students from the Base Pair class at Murrah and the Student Oriented Academic Research (SOAR) class at Jim Hill to organize, promote and present information on biomedical science and health care to lay members of the Jackson community. The philosophy that drives the Forum is to "*capture the power of the child to educate the village.*" Piloted in 2002-2003 with talks on the "West Nile Virus" and "Bioterrorism Agents," a presentation on "Health Risks Associated with Type II Diabetes" was delivered in October, 2003. Three to four presentations/year on issues of compelling importance to the general public are planned. Students are trained in biomedical information research, mentored by biomedical research professionals, and tutored in the finer elements of public discourse. Use of

advanced electronic databases (Medline, PubMed) and presentation software, including PowerPoint™ and Microsoft Publisher™, is a specific element of training. Evening presentations to the general public are offered on the UMC campus. Evaluation of the impact of the program on health knowledge is a specific component of the activity. (Howard Hughes Medical Institute and the University of Mississippi Medical Center).

## 1:45 Break

# 2:00 DEVELOPMENT OF THE PUBLICATION, IMPORTANT PLANTS OF THE MISSISSIPPI COASTAL REGION

Kimberly Harvey\* and Shelia A. Brown, Mississippi Gulf Coast Community College, Jackson County Campus, University of Southern Mississippi, J.L. Scott Marine Education Center and Aquarium, Biloxi, MS 39530, and National Aeronautics and Space Administration

Native plants indigenous to the Mississippi Gulf Coast are presented in a booklet developed for the Grand Bay National Estuarine Research Reserve (NERR). The primary objective of this project was to assist with the development of descriptive text necessary for each of the images that was selected for the book by representatives of the Mississippi Department Marine Resources and the Grand Bay (NEER). Digital photography was used to capture images of the plant species in their natural environment. Information about plant types, habitat areas, flowering times, heights, and detailed descriptions were included for each species. This booklet provides tourists, educational groups, as well as local residents, valuable information for identifying the diverse types of plant life that are commonly seen along the salty and fresh water coastal areas of Mississippi.

# 2:15 CONSTRUCTION OF A NOVEL DNA TEACHING MANIPULATIVE

Raymond Scheetz\*, Aimée T. Lee, and Rosalina V. Hairston, University of Southern Mississippi, Hattiesburg, MS 39406

Available models of DNA do not relate the three dimensional physical model to the two-dimensional chemical structures depicted in classes and in text books, and students may have difficulties identifying the components of ball and stick models, which use color-coded spheres to represent atoms. Additionally, prior models do not make the formation of anti-parallel DNA strands obvious, when complimentary bases pair, an important concept in DNA structure. The injection-molded teaching manipulatives described in this paper assembles DNA from nucleotide units, in much the same way that DNA is enzymatically made in cells, rather than by assembling individual atoms. This model is NOT an atomic scale model, but rather one designed specifically to be used as a hands-on teaching manipulative. Ring systems of bases and sugars are molded flat with chemical structures clearly depicted, for easy

identification and correlation with textbook structures. Nucleotide units of the present model clearly show how complementary bases hydrogen bond, and how nucleotides in the same strand link through 3'5' phosphodiester bonds. Proper spatial orientation of base, sugar, and phosphate groups generates the familiar double helix, with an evident major and minor groove. By trial and error pairing of nucleotides in alternative orientations, students intuitively discover the underlying features of molecular structure which are of paramount importance in DNA replication, repair, and transcription.

#### 2:30 FACILITATING LEARNING IN INTRODUCTORY BIOLOGY BY USING MODELS

Rosalina V. Hairston\* and Aimée T. Lee\*, University of Southern Mississippi, Hattiesburg, MS 39406

A DNA model developed by Dr. Ray Scheetz was used to collect data for research about using models to facilitate student learning. Two methods of data collection, qualitative and quantitative, were used in this research. Two groups of students enrolled in an introductory college biology laboratory were compared in this study. The teaching assistant gave an introductory lecture describing the basics of a DNA molecule to all students. Group one (N = 50) was not allowed to manipulate the DNA model while group two (N = 63) was allowed to manipulate the model for ten minutes. We then administered an 11-question quiz regarding information about the different components of a DNA molecule. A three-question survey was administered to the students who used the DNA model. A T-test was used to statistically analyze if there is a significant difference between the two groups of students. The results reveal that there was no significant difference between the scores of the students using the DNA model and the scores of the students not using the DNA model. However, the mean of group two was higher than the mean of group one. The qualitative surveys consisted of questions referring to how the model helped them conceptualize the structure of DNA. Although the difference in groups was not statistically significant, the survey revealed that the model helped them understand the abstract aspects of the DNA molecule.

#### 2:45 Divisional Poster Session

#### CREATING EDUCATIONAL MATERIALS FOR EXHIBITS AT THE WALTER ANDERSON MUSEUM OF ART

Phung Kim Hoang\* and Patricia Pinson, Mississippi Gulf Coast Community College, Jackson County Campus, National Aeronautics and Space Administration, and Walter Anderson Museum of Art, Ocean Springs, MS 39564

The purpose of this project was twofold: to conduct research on the Pascagoula River Basin and river system and to compile history and facts in order to create handouts for docents (educated volunteers) who provide tours at the Walter Anderson Museum of Art. Sources came from the Nature Conservancy, and libraries, as well as material from the Sun

Herald Special Reports. Additionally, research on the life of Walter Anderson was gathered for the "Fortune's Favorite Child: The Life of Walter Anderson" exhibit. This exhibit was featured November 13, 2003–February 1, 2004. This information was available for docents to use in presentations to visitors.

#### COASTAL FLORA AND FAUNA PORTRAYED IN ANDERSON'S ART

Phung (Lily) Nguyen\* and Cindy Guay, Mississippi Gulf Coast Community College, Jackson County Campus, National Aeronautics and Space Administration, and Walter Anderson Museum of Art, Ocean Springs, MS 39564

Walter Anderson was a "Renaissance Man." Well-educated with many talents, Anderson was a watercolorist, muralist, author, printer, woodworker, environmentalist, decorator, and potter. The goal of this project is to inform and educate young visitors using activities that showcase local flora and fauna portrayed in Anderson's work at the Walter Anderson Museum of Art. The project developed these activities for the educational center within museum.

#### GULF COAST RESEARCH LABORATORY AND NATIONAL MARINE FISHERIES SERVICE: PARTNERS IN SCIENCE AND CONSERVATION

Ammanda Bowman\* and Joyce Shaw, Mississippi Gulf Coast Community College, Jackson County Campus, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39564, and National Aeronautics and Space Administration

Over the last fifty years, the Gulf Coast Research Laboratory (GCRL) has partnered with the National Marine Fisheries Service (NMFS) and its predecessors on major scientific and conservation projects. Sharing personnel, marine vessels, and information, both agencies have generated a body of knowledge that documents and describes northern Gulf of Mexico marine resources. This project focuses on the history of the relationship between GCRL and NMFS. The publications of Dr. Thomas McIlwain, a former GCRL director (1989–1994) and former Fishery Administrator at NMFS Pascagoula Laboratory, as well as other GCRL scientists who have worked on NMFS projects will be added to an online bibliographic database. Archival materials documenting the relationship between the two agencies has been organized and filed. A poster describing the project is being presented at the 2004 annual meeting of the Mississippi Academy of Sciences.

#### DEVELOPING AN UNDERGRADUATE FIELD BIOLOGY PROGRAM

Sarah Armstrong\* and James P. McKeown\*, Millsaps College, Jackson, MS 39210

There are many opportunities for undergraduates to study abroad in a classroom setting, but biological field research is usually reserved for graduate students. In the summer of 2002, we began a successful undergraduate research

program at the Moyers Biocultural Reserve in southern Yucatan, a 2000 ha tract of second-growth dry forest owned by Millsaps College and administered in cooperation with the Mexican government. Students are assigned a problem fitting their background in biology. Projects may be done as Undergraduate Research credit or as part of the Honors or Ford Fellowship Programs. Each student does a literature review prior to the summer field season. In the field, students collect, identify, and preserve their specimens, and maintain field notebooks. Upon returning to Jackson, each student writes a formal report of their findings in the standard research report format. Students are evaluated on use of the literature, their collections and identifications, and their final report. In our first season, we and five students created a temporary field laboratory at a partially-restored plantation near the reserve. Four of the students collected and identified insects. The fifth student began a catalog of flowering plant pollen, to be compared to samples from the pre-Columbian archaeological site on the property to identify the plant materials available to the former inhabitants. Students learned a lot of biology, but also life-long skills of communication, self-reliance, tolerance, and reflection.

#### THE NSF GK12 FELLOWSHIP PROGRAM AT THE UNIVERSITY OF SOUTHERN MISSISSIPPI: A BIOLOGIST IN THE SIXTH GRADE

Meagan Williams, University of Southern Mississippi, Hattiesburg, MS 39406

GK12 is a nationally funded project by the National Science Foundation. At the University of Southern Mississippi there are twelve graduate fellows from several different departments that interact with a number of teachers from all grade levels. Its goal is to provide a larger content base for teachers at local elementary and secondary schools and to broaden the scientific knowledge of teachers at all grade levels. As one of the biology fellows, I made weekly visits to three different sixth grade classes during the fall of 2003. During these visits, students and teachers alike learned what science is, who does science, how science is done and a variety of topics within the scientific field. Some of the activities/demonstrations included: an introduction to chemistry through a liquid nitrogen demonstration, a classroom activity making silly putty and slime and an activity that demonstrated the pH of various household chemicals. Other topics covered included a fossil dig activity using chocolate chip cookies, an edible cell model constructed out of Jello, an energy lesson using pendulums, and a group activity about animal communication. Throughout the course of only a few months, ~80 sixth graders and three teachers were exposed to the basics of science, research and learning through several entertaining, but thought provoking activities and demonstrations.

#### Divisional Talks

##### 3:15 DEVELOPING INTERACTIVE EXHIBITS LINK-

##### ING THE MARINE ENVIRONMENT TO EVERY-DAY LIFE

Adam Ridgdell\* and Jennifer Hale, Cooperative Intern Program Mississippi Gulf Coast Community College, Jackson County Campus, University of Southern Mississippi, J.L. Scott Marine Education Center and Aquarium, Biloxi, MS 39530, and the National Aeronautics and Space Administration

The purpose of this project was to develop an interactive exhibit to educate and inform students and the general public of the importance of products and extracts of marine biota in the development of commercial products. The exhibit includes products containing essential components from the sea, which affect the daily lives of humans. Each item was coded to allow the visitors to scan the product. As visitors scan specific products, information regarding the marine resources and utilization of the product is displayed on a monitor. This exhibit will be on permanent display at the J.L. Scott Marine Education Center and Aquarium in March 2004.

##### 3:30 IMPROVING AN ANIMAL CLASSIFICATION PROJECT FOR K-4 STUDENTS

Erin Canady\*, Jennifer Stokley, and Teresa Callahan, Cooperative Intern Program Mississippi Gulf Coast Community College, Jackson County Campus, National Aeronautics and Space Administration, and Magnolia Park Elementary School, Ocean Springs, MS 39564

The primary objective of this effort has been to enhance an animal classification project which is implemented each academic year. A demonstration poster has been created based on computer and literature research related to comparing and contrasting characteristics. This poster improves K-4 students' knowledge on how to classify animals. This project has been designed to help the K-4 students give presentations in front of the class to enhance and reinforce their classmates' knowledge of classifying animals according to physical characteristics, combined with habitat, diet, and life span.

##### 3:45 THE DEVELOPMENT OF A COMPUTER DATABASE FOR MANAGEMENT PURPOSES AT THE J.L. SCOTT MARINE EDUCATION CENTER AND AQUARIUM

Phillip B. Conn\* and Alexander L. Schesny, Mississippi Gulf Coast Community College, Jackson County Campus, University of Southern Mississippi, J.L. Scott Marine Educational Center and Aquarium, Biloxi, MS 39530, and National Aeronautics and Space Administration

The purpose of this project was to create a database of all the fish, invertebrates, plants, and aquatic life support systems within the Center's approximately 60 public aquariums. All data for this project were compiled from archived log books, information collected from aquarium staff, and through current observations, measurements, and photographs. Using a sophisticated aquarium software program, these data will be utilized daily by the aquarium management to "better track"

health trends of the aquatic inhabitants and their environments.

### ZOOLOGY AND ENTOMOLOGY

Chair: Alex D.W. Acholonu, Alcorn State University

Vice-chair: Elgenaid Hamadain, Jackson State University

## THURSDAY AFTERNOON

### Deer Isle

Symposium on Sickle Cell Anemia and Its Prevalence among Blacks in some Southern States of the USA

#### 1:00 A RETROSPECTIVE STUDY ON THE PREVALENCE OF SICKLE CELL ANEMIA IN LOUISIANA 1990–1995

Anthony Russell\*, Alex D.W. Acholonu, Abram Dunbar, and George Bates, Alcorn State University, Alcorn State, MS 39096

Sickle cell anemia is an inherited blood disorder that has almost been exclusively found in people of African descent. It is thought that the disorder may have evolved in people from places where malaria and similar diseases were rampant. However, as time has passed and people have spread across the globe to different places, this disease has become more of a nuisance than an advantage. Sickle cell anemia is caused by an auto recessive trait, so it must be inherited from both parents. This genetic defect results in red blood cells that are puffy or sickle shaped as opposed to the normal indented disc shape of red blood cells. The sickle-shaped cells are easily destroyed which causes a decrease in the red blood cell count, thereby causing anemia. Sickle cell anemia is by far the most medically important hemolytic disease simply because of its frequency and severity. On the other hand, because of its geographic distribution and natural targets it has been widely ignored. This research serves to highlight the severity and frequency with which sickle cell anemia occurs. It was conducted with the aid of reports and data collected by the Louisiana State Department of Health and the Center for Disease Control and Prevention (CDC). It shows that sickle cell anemia is a problem among blacks that needs more attention.

#### 1:20 THE PREVALENCE OF SICKLE CELL ANEMIA IN LOUISIANA 1995–2003

Joyce White and Alex D.W. Acholonu\*, Alcorn State University, Alcorn State, MS 39096

In the United States, people of African ancestry are the most common carriers of the sickle cell trait. People who are heterozygous for sickle cell anemia (HAHS) are partially resistant to malaria, a serious disease that affects red blood

cells. People who are homozygous for normal hemoglobin (HAA), on the other hand, have no resistance to malaria. Sickle cell anemia is caused by a change in one of the polypeptides found in hemoglobin, which is the protein that carries oxygen in red blood cells. The purpose of this study is to find out the prevalence of sickle cell anemia in the state of Louisiana covering the period of 1995–2003. Data for this research was provided by the Louisiana State Health Department. Findings from the data indicate that sickle cell anemia is a serious problem among African American in the United States that needs to be addressed. More research needs to be done to find medical treatments to control sickle cell anemia.

#### 1:40 THE PREVALENCE OF SICKLE CELL ANEMIA IN TEXAS, 1995–2003

Alex D.W. Acholonu and Tonnetta Todd\*, Alcorn State University, Alcorn State, MS 39096

Sickle cell anemia is primarily a disease among African Americans. Often times many blacks are not aware of this deadly disease. Sickle cell anemia is an inherited red blood cell disorder. Normal red blood cells are round like doughnuts, and they move through blood vessels to deliver oxygen to the body. Sickle-shaped red blood cells are sluggish and tend to lodge in blood vessels, which causes pain from a lack of oxygen. Sickle cell anemia trait must be inherited from both parents. When a person is born with the disease, it will be present throughout life. This research serves to spotlight the prevalence of sickle cell anemia in Texas. More must be done about this very serious disease of the blood. The State of Texas performs a test on pregnant women and newborn babies to determine the presence of the trait. It is a simple blood test called the hemoglobin electrophoresis test. The data for this study was gathered with the assistance of the Texas State Department of Health, the Texas Report Magazine, and various websites. This study highlights the fact that it is imperative for more studies to be conducted on sickle cell anemia to reduce or eliminate its prevalence.

#### 2:00 PREVALENCE OF SICKLE CELL ANEMIA IN MISSISSIPPI, 1995–2003

Ranada Carter, Queriston Haynes, and Alex D.W. Acholonu\*, Alcorn State University, Alcorn State, MS 39096

Sickle cell anemia is an inherited blood disorder characterized by primarily chronic anemia and episodes of pain. It affects millions of blacks both in Africa and elsewhere. The disease occurs in about 1 in every 500 African American births and 1 in every 1000 to 14000 Hispanic American births. The prevalence of sickle cell anemia is extremely high among the general African American population. The purpose of this study is to assess the prevalence of sickle cell anemia in the State of Mississippi. It was conducted with the assistance of the Mississippi State Department of Health reports, among others. This study indicates that sickle cell anemia is a disease that deserves attention. It brings out the importance of African

Americans undergoing genetic testing for sickle cell anemia. Knowing whether one has sickle cell anemia or sickle cell trait can significantly reduce the number of sickle cell disease cases, morbidity or mortality. To control the prevalence of this disorder in the state of Mississippi, it is recommended that any would-be husband and wife undergo a sickle cell anemia test before marriage.

## 2:20 Divisional Poster Session

### SEROPREVALENCE OF *TOXOPLASMA GONDII* INFECTION IN MARKET WEIGHT PIGS FROM CRYSTAL SPRINGS, MISSISSIPPI

Brandi Payne\*, Alex D.W. Acholonu, Abram Dunbar, and George Bates, Alcorn State University, Alcorn State, MS 39096

Pigs are considered an important meat source for *Toxoplasma gondii*. They may be infected directly or by ingestion of oocysts-contaminated feed, water, or soil, or by consumption of infected rodents. *T. gondii* infection in food-producing animals is a potential public health problem because the infection can be transmitted to humans through handling and consumption of raw or undercooked meat that contains *T. gondii* bradyzoites encysted in muscle tissue. Immuno-compromised individuals and fetuses have the greatest risk for developing clinical toxoplasmosis. The objective of this study is to determine the prevalence of anti-*Toxoplasma gondii* antibodies in market weight pigs from Crystal Springs, Mississippi. Literature review shows that no significant study of this kind has been done previously in Mississippi. Between the months of April 2002 and July 2003, blood samples were collected from a slaughterhouse in Crystal Springs, MS. The blood samples were centrifuged and the sera collected, labeled, and stored in the freezer at -20 °C. A modified agglutination test (MAT) was performed at three different dilutions, namely, 1:25, 1:50, and 1:500. Of 824 samples tested, 435 (53%) were positive for anti-*Toxoplasma gondii* antibodies. At a titer of 1:25, 1:50, and 1:500, 439 (53.3 %), 353 (30 %), and 308 (27%), respectively, were positive. It is advisable for all pork to be cooked thoroughly before consumption.

## Divisional Talks

### 2:50 FORENSIC ENTOMOLOGY OF THE MISSISSIPPI PINE BELT

Joseph Curry, University of Southern Mississippi, Hattiesburg, MS 39406

The use of insects in forensic cases has been a fairly new aspect in criminal investigation. However, several difficulties exist in the use of forensic entomology. Insects vary from region to region, and currently most information about forensic insects is derived from approximately 12 or so areas around the United States. Currently, the closest forensic entomology research to southern Mississippi was conducted in northern

Tennessee, St. Louis and in the southern Florida panhandle. Utilizing recently deceased carcasses of Garnet's short-eared bushbabies from the University of Southern Mississippi, insects were periodically collected, measured, and identified to determine the entomological timeline for death scenes in the Pine Belt region. The animals, which died of natural causes, were placed in an undisturbed, semi wooded area in northern Forrest County. Based on the research conducted, flies were determined to be the best indicators of time since death. The flies grew in predictable instars or stages, and these stages were used to determine the approximate time since the animal carcasses were exposed in the Pine Belt. This data has the potential to give forensic investigators in southern Mississippi valuable information on the reconstruction of the time of death of the victim.

### 3:10 ASSESSEMENT OF *CORYNORHINS RAFINESQUI* AND *MYTOIS AUSTRORIPARIUS* ROOSTS CHARACTERISTICS AT ST. CATHERINE CREEK NWR AND LAUREL HILL PLANTATION, ADAMS COUNTY, MISSISSIPPI

Alison R. Sherman\* and Elgenaid Hamadain, Jackson State University, Jackson, MS 39217

Roost sites of Rafinesque big-eared bats (*Corynorhinus rafinesquii*) and Southeastern Myotis (*Myotis austroriparius*) were examined in abandoned buildings and cisterns at St. Catherine Creek National Wildlife Refuge and Laurel Hill Plantation, Adams County, Mississippi, from February through December, 2002 and 2003. Seven abandoned structures and one culvert were documented to serve as roost sites for *C. rafinesquii* on the refuge and plantation. Three of these sites were verified to be maternal roosts. One of the colonies contained 50 individuals, recorded on July 12, 2003. Another maternal colony on property adjoining the refuge contained 35 *C. rafinesquii* on September 16, 2002. Other structures supported from 0–9 individuals during the survey period. Six of the abandoned structures were also being used by *M. austroriparius* individuals. One of these structures contained 5 individuals on June 21, 2003. Other structures supported from 0–1 individual during the survey period. An additional roost for *M. austroriparius* containing approximately 1500 individuals was discovered in a cistern on Laurel Hill Plantation in November, 2002. Sixty-eight *C. rafinesquii* and one-hundred seventy-five *M. austroriparius* were hand netted in the roosts after pups were volant. Captured bats were weighed, sexed, measured and *C. rafinesquii* individuals were banded using split ring bands. Standard mist netting was conducted at 24 sites on the refuge and plantation. Twenty-one *C. rafinesquii* were captured at three sites (29% of all captures). Sixteen *M. austroriparius* were captured at 5 sites (22 % of all captures). Roost characteristics for *C. rafinesquii* and *M. austroriparius* were evaluated and data regarding internal temperature, humidity and light intensity, roost dimensions, location of bats within the roost, and roosting substrate were recorded. A

habitat characterization using the center-point-quarter technique was conducted at each site.

3:30 PRELIMINARY STUDIES ON WATER QUALITY  
OF THE BIG BLACK RIVER IN MISSISSIPPI  
(POLLUTION STUDIES)

Annie M. Vaughan\* and Alex D.W. Acholonu, Alcorn State University, Alcorn State, MS 39096

Water quality can be closely linked to the surrounding environment and land use and is affected by community uses such as agriculture, urban and industrial use, and recreation. The Big Black River Basin is one of Mississippi's largest watersheds, with the Big Black River being its only major water source. This basin has numerous possible sources of pollution in its surroundings. Oil and gas production are major industries in this area and cattle ranching and farming are present. The purpose of this study is to observe and analyze changes in the concentration of pollutants at various ranges and seasons in order to effectively evaluate the water quality of the Big Black River. Three sample sites, at 50-meter intervals, were established. Samples were collected three times during the fall of 2003 and analyzed for pollutants using the LaMotte Testing Kit. Atmospheric temperature, surface temperature, conductivity, dissolved oxygen, and turbidity were observed and recorded on site. The results show that the water quality of

the Big Black River meets the Mississippi Water Quality Standards. This study, being a seasonal one, is being continued. This study was conducted under SEEDS Program, sponsored by the Ecological Society of America (ESA) and funded by The Andrew W. Mellon Foundation.

3:50 ORIENTATION OF JUVENILE LAKE STURGEON  
(*ACIPENSER FULVESCENS*) IN LABORATORY  
AQUARIA

Raven Childers\*, Jimena Aracena, and Marty Harvill, Mississippi University for Women, Columbus, MS 39701

An effort to reintroduce the endangered species *Acipenser fulvescens* into lakes and rivers requires raising juvenile fish in an aquaculture setting. In this experiment we videotaped eight individual juvenile fish in an aquarium for five minute intervals in order to study their orientation and swimming behavior. The fish showed preference for a white background as opposed to black and had strong thigmotaxis. Otherwise, there was enormous variation between fish, suggesting that more research is needed to understand juvenile behavior in the aquaculture setting. This variation may lead to selection for survival in aquaculture and may be detrimental to their reintroduction to their natural habitat.

4:10 Divisional Business Meeting

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